Serum Thyroid Peroxidase Antibody (Tpo-Ab) as an Early Marker of Thyroid Dysfunction among Diabetic and Hypertensive Patients in Kano Metropolis

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ABSTRACT

Thyroid antibodies are antibodies against the thyroid gland. Thyroid peroxidase antibody (TPO-Ab) is the most significant thyroid autoantibody. An increased level suggest the manifestation of autoimmune mechanisms that leave individuals susceptible to other autoimmune diseases and conditions. This study sought to compare the level of TPO-Ab in diabetics and hypertensives with apparently healthy people. It was hoped that a significant difference might add merit to the use of TPO-Ab as an early marker of thyroid dysfunction. A total of 80 participants attending diabetic and hypertensive clinics in Kano were recruited as the test group for the study; 44 were diabetic, 33 were hypertensive and 8 were both hypertensive and diabetic. 20 Apparently-healthy individuals free from diabetes and hypertension served as the control group. The mean ± standard deviation of the age of diabetic subjects was found to be 51.57 ± 14.17 and ranged between 22 and 82 years while the mean ± standard deviation of the age of hypertensive subjects was 52.91 ± 11.34. The mean ± standard deviation of serum TPO-Ab was found to be 20.92 ± 9.4, and 13.34 ± 9.34, and 14.80 ± 5.52 respectively in diabetics, hypertensive patients and the control group. A t-test showed no statistically significant difference in diabetics and hypertensives when compared to the control group. In conclusion, while the increased level of TPO-Ab in diabetics confirms the links between thyroid autoimmunity and diabetes, TPO-Ab is unsuitable as an early marker of thyroid dysfunction in diabetics and hypertensives.

Keywords; Thyroid anti-peroxidase antibody, hypertension, diabetes

INTRODUCTION

Diabetes mellitus type 2 (also known as non-insulin diabetes mellitus) is a long-term metabolic disorder that is characterized by high blood sugar and insulin resistance. It represents 90-95% of all diabetes cases. The International Diabetes Federation reports 425 million people living with diabetes, with approximately half of them undiagnosed.[1] In Nigeria, the IDF reports a prevalence of 1.7%, and a growing burden of diabetes mellitus.

Type 2 diabetes mellitus is often accompanied by chronic complications associated with morbidity with a shorter life expectancy. Some of these complications include a higher risk of cardiovascular disease (including ischemic heart disease and stroke), retinopathy, uropathy and increased rates of hospitalizations. In the developed world, type 2 diabetes is the largest cause of non-traumatic blindness and kidney failure. It has also been associated with an increased risk of cognitive dysfunction and dementia through disease processes such as Alzheimer's disease and vascular dementia. Other complications include Acanthosis nigricans, sexual dysfunction, and frequent infections.[2]

Diabetic patients have a higher tendency of developing thyroid disorder compared with the general population because patients with one organ-specific autoimmune disease are at risk of developing other autoimmune disorders.[3] Hyperthyroidism is also typically associated with worsening glycemic control and increased insulin requirement. There is underlying increased hepatic gluconeogenesis, rapid gastrointestinal glucose absorption and probably increased insulin resistance. Thyrotoxicosis may unmask latent diabetes.[3]

In Nigeria, the prevalence of hypertension is on an upward trend. A systematic review by Akinlua *et al.* reported a prevalence of 17.5-51.6% in urban areas and 4.6-43% in rural areas of Nigeria.[4]

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Date manuscript was received: 24/5/2021
Date manuscript was accepted: 2/7/2021

Thyroid autoimmunity has been implicated in cardiovascular system dysfunction and blood pressure derailment. In patients with hypothyroidism, an increased incidence of diastolic hypertension has been documented, and the suggestion of an increased prevalence of hyperthyroidism in the general hypertensive population is evidence of the relationship between thyroid hormone and cardiovascular system.

Thyroid autoantibodies are antibodies targeted against one or more components of the thyroid gland. The most clinically relevant thyroid autoantibodies are thyroid peroxidase antibody (TPO-Ab), thyrotropin receptors antibody (TRAbs) and thyroglobulin antibodies (TGAbs). These autoantibodies are often used as predictors of thyroid dysfunction and thyroid cancer risks.[5]

TPO is a membrane protein that catalyzes thyroid hormone synthesis thus, the presence of TPO-Ab in the blood may reflect an alteration in the immune system and lymphocytic infiltration in the thyroid. Thyroid cancer is strongly associated with elevated level TPO-Ab.

Numerous links have been established between diabetes and hypertension with thyroid dysfunction. But few studies have been done to show a potential link between thyroid autoantibodies, and diabetes and hypertension. It was hoped that this study would bring conclusive proof, linking or rejecting claims of a link between the presence of thyroid autoantibodies, and diabetes and hypertension. It is also hoped that the study might provide proof that thyroid autoantibodies can serve as early markers for thyroid dysfunction in patients with diabetes mellitus or hypertension.

The specific objectives of this study are therefore to determine the serum concentration of thyroid autoantibody (TPO-Ab) in diabetic and hypertensive patients; comparison of levels in diabetics, hypertensives and the control group

MATERIALS AND METHOD

This study was carried out at Murtala Muhammad Hospital, Kano. The study was designed as a Cross-sectional study and participants were chosen via Simple Random Sampling.

A total of 80 participants attending the diabetic and hypertensive control clinic were recruited as the test group for the study, 44 were diabetic, 33 were hypertensive and 8 were both hypertensive and diabetic. Twenty (20) apparently-healthy individuals free from diabetes and hypertension served as the control group. Only diabetic and hypertensive patients that gave their signed consent for the research were recruited for the study.

Ethical clearance was sought from The Research Ethics Committee of Hospital Management Board, Kano. Informed consent was also sought from each individual before the administration of the questionnaires and sample collection. Socio-demographic data and medical history were collected using a structured interviewer-administered questionnaire.

Sample collection, processing and analysis

About 4ml of venous blood was collected aseptically from the cubital fossa of all the participant and dispense into gel activator containers. The samples were then centrifuged at 10,000rpm for 5 minutes. The serum was then transferred into prelabelled plain containers and stored at -20ºC until assay.

All samples were analyzed for anti-thyroid peroxidase autoantibody using Microparticle Enzyme Immunoassay (MEIA) using Rayto RT-2600C ELISA washer/Reader and Accubind™ ELISA kit due to its high specificity, sensitivity and fewer interferences. The manufacturer's instructions were strictly followed.

Statistical analysis

Data were summarized and entered in to excel worksheet. The summarized data were checked and cleared of errors using triangulation tool. Thereafter, SPSS version 20.0 was used for data analysis. A p-value of <0.05 was considered significant at 95% confidence interval.

RESULTS

General Characteristics

Out of 105 subjects that participated, 44 were diabetic patients, 33 were hypertensive patients, 8 were both diabetic and hypertensive and 20 subjects served as the control group.

The mean ± standard deviation of the age of diabetic subjects was 51.57 ± 14.17 and ranged between 22 and 82 years while the mean ± standard deviation of the age of hypertensive subjects was 52.91±11.34.

Mean Thyroid Peroxidase Antibody level compared between diabetic patients, hypertensive patients and the control group

Table 1 and 2 depict the mean ± SD of thyroid peroxidase antibody in diabetics, hypertensive patients and the control group respectively as 20.92 ± 9.4, 13.34 ± 9.34, and 14.80 ± 5.52 respectively. These values prove that there is no statistical significance between the test subjects (Hypertensives and Diabetics, and the control group).

Table 1: Mean serum thyroid peroxidase antibodies level compared between diabetic patients and the control group

Diabetic patients		Control	P-value
Mean ± S.D	20.92 ± 9.40	14.80 ± 5.52	*0.132

*No statistical significance difference

Table 2: Mean serum thyroid peroxidase antibody level compared between hypertensive patients and the control group

Hypertensive Patients	Control	P-value
13.4 ± 9.34	14.80 ± 5.52	*0.853

*No statistically significant difference

DISCUSSION

Our study discovered lowered TPO-Ab levels that were not significant in hypertensive subjects when compared to the control group. This is in agreement with what Alavi *et al.*[6] reported in India. Their study revealed a higher TPO-Ab concentration in the control group (6.07 ± 9.02IU/mL) compared with 2.27 ± 2.94IU/mL in the subjects.

Another study in Tunisia showed that mean serum TPO-Ab level was lower in pregnant patients with hypertension than in the control group. [7] This is similar to the findings of this study.

However, our findings disagree with Tohidi *et al.*[8] who found elevated serum thyroid peroxidase levels in hypertensive men and suggested that thyroid autoimmunity might have a greater role in cardiovascular dysfunction than believed. As reported also by Shimizu *et al.*[9] TPO-Ab is significantly positively associated with subclinical hypothyroidism with hypertension but not with subclinical hypothyroidism without hypertension in the euthyroid.

Our study also reported a higher TPO-Ab level in diabetics. This follows the general pattern of increased prevalence of thyroid dysfunction in diabetics when compared with the general population. However, the difference was not statistically significant. Our result agrees closely with the work of Noori and Al Gharbawi [10] who found similar levels of TPO in Type 2 diabetics and the control group.

In contrast, a 2007 study by Gonzalez *et al.* found markedly increased TPO-Ab levels in type 1 diabetics. [11] This difference might be because only Type 1 diabetics were recruited as the case group. In addition, the subjects were recruited in 1984 and then monitored for a decade. This claim is further strengthened by the findings of Sanyal *et al.*[12]

who also found elevated TPO-Ab levels in 50 Type 1 diabetics when compared to the control group.

CONCLUSION

The mean ± SD of serum thyroid peroxidase antibody was higher in diabetic patients compared to the control group and lower in hypertensive patients compared to the control group. The study confirms the oft-suspected relationship between diabetes and autoimmunity. However, the findings of this study show that TPO-Ab levels aren't high enough to suggest its use as an effective marker of early thyroid dysfunction.

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