



Significance of TPO and Some Biochemical Parameters in Goiter Patients

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ABSTRACT

Goiter refers to disorder of thyroid gland function which is characterized by increase or decrease in thyroid hormone secretion (hyperthyroidism or hypothyroidism). Goiter diagnosis relies on the appearance of enlarged thyroid gland and the area around, it may be expanded in unlike shape and may has nodules in other patients, appeared in one side of the gland. Thyroid nodules are popular, mostly are benign, but nearly 5% are malignant. Patient with goiter disease was diagnosed by measurement the level of Thyroid Stimulating Hormone (TSH), Triiodothyronine (T3), and Thyroxine (T4) that evaluate the function of thyroid gland. Symptoms manifested with the development of goiter disease involving hard swallowing and breathing caused by abnormal air flow inside and outside of the trachea. In this research study, we had determined Thyroperoxidase (TPO), as an unprecedented biomarker for the diagnosis of goiter disease. In addition, we investigated the differences in the conventional biomarkers T3, T4, and TSH level between goiter patients and control groups. The results show insignificant decreased in T3 and T4 and significantly increased in TPO and TSH in Goiter patients when compared with control groups.

Keywords: Goiter, Thyroid hormone, TPO.

INTRODUCTION

Goiter is a clinical disease that distinguished as enhancement in size of the thyroid gland with appearance of nodules making thyroid gland weight to reach to 20-25g with volume of 19ml and 25ml in women and men, respectively.^{1,2}

The sample of goiter can be manifested as a heterogeneous shape of solid and cystic nodules. A solid nodule recognized as adenoma usually known as hyperplastic nodule that totally closed while cystic specimen defined as colloid cysts or bleeding cysts from nodule hemolysis.

Fibrous is usually appeared in microscope in about ten percent of patients with goiter.³

Globally, researches referred to lower concentration of iodine and the percentage of patients with goiter about 4.7 – 37.3%.⁴

Goiter disease was almost found to affect women, that enhanced with age and maximum incidence was found to be with age of sixteen.

Besides that, there was many risk factors for thyroid nodules development and augmentation in thyroid size in female patients such as the number of delivery, increased weight, and smoking.⁵

Thyroid-Stimulating hormone (TSH) is a glycoprotein related with activation of iodine metabolism in the body.

TSH is act by binding to cell membrane G protein-coupled receptor provide cAMP and phospholipase C signaling pathway to activate iodine absorption and production of

thyroglobulin with excretion of T3 and T4 that turn of thyroid hormone synthesis.⁶

Thyroperoxidase (TPO) is an enzyme that catalyze the conversion of Iodide ion into iodine atom by oxidation to be incorporated into tyrosine amino acid of thyroglobulin protein which is a crucial step in thyroid hormones (T4) or (T3) biosynthesis.⁷

Goiter with hypothyroidism as one or more nodules present that increased secretion of thyroid stimulating hormone but deficient in T3 and T4 levels.⁸

Also, there is fact that six percent of patients with goiter can be development of thyroid cancer, and may be development from benign to malignant disease.⁹

MATERIALS AND METHODS

In this study we took two groups, the first was a twenty healthy individuals (control group and the second was twenty individual diagnosed to have goiter (patients), in addition of that, control groups were matched for age and sex with the patients groups. Various questions had been asked for both control and goiter individuals such as genetic disease, drugs history, weight, height and smoking.

Biomarkers that were determined in this research study including (TSH, T3, and T4) in addition to TPO enzyme that was detected by cobas e411 roche.

Statistical Analysis

The statistical analysis in this research includes mean, standard deviation and p. value of goiter patients and control groups determined by a best statistical software



packages (Microsoft SPSS), significant differences was measured by P. value that significance ≤ 0.05 .

Also there was correlation test between different biomarkers considering P. value ≤ 0.05 was significant.

RESULTS AND DISCUSSION

The results appeared that significant increase in Age and BMI in goiter patients as compared with control groups as illustrated in Table 1.

In addition, there was insignificant decreased of T3, T4 level in goiter patients when compared with control groups, as shown in Table 2.

Table 1: Means of Age, BMI in Goiter Patients and Control Groups

Parameters Mean \pm St	Controls	Patients with Goiter	P. Value
Age	27.50 \pm 4.15	32.285 \pm 5.85	0.167
BMI (Kg/m ²)	23.71 \pm 3.45	25.85 \pm 3.07	0.120

*Significant using spss for two independent means at significance * (P \leq 0.05), ** (P \leq 0.01)

Table 2: Serum T3 and T4 Levels in Goiter Patients and Control Groups

Parameters Mean \pm St	Control	Patients	P. Value
T3	1.087 \pm 0.058	1.00 \pm 0.106	0.15
T4	91.21 \pm 7.23	83.44 \pm 9.098	0.13

*Significant using spss for two independent means at significance * (P \leq 0.05), ** (P \leq 0.01)

Table 3: Serum TSH and TPO Levels in Goiter Patients Groups and Controls

Parameters Mean \pm St	Control	Patients	P. Value
TSH	1.586 \pm 0.637	82.60 \pm 40.60	0.011*
TPO	3.55 \pm 1.93	283.9 \pm 282.21	0.05*

*Significant using spss for two independent means at significance * (P \leq 0.05), ** (P \leq 0.01)

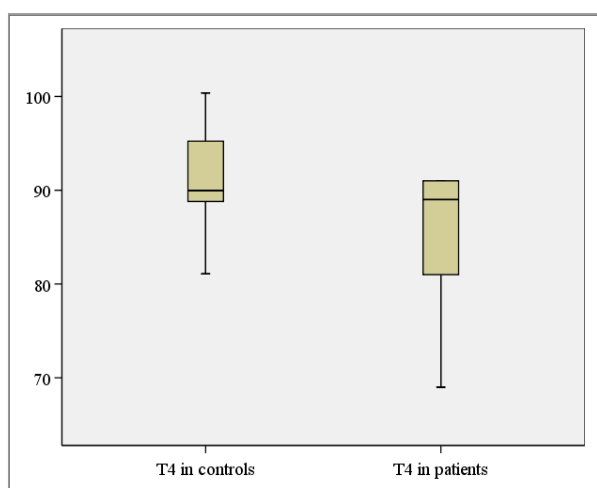


Figure 1: The Boxplot Graph of T4 of Controls and Goiter Patients

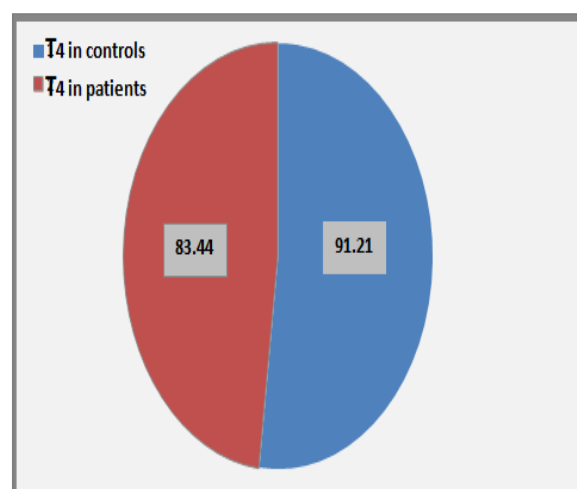


Figure 2: A pie chart of T4 of Controls and Goiter Patients

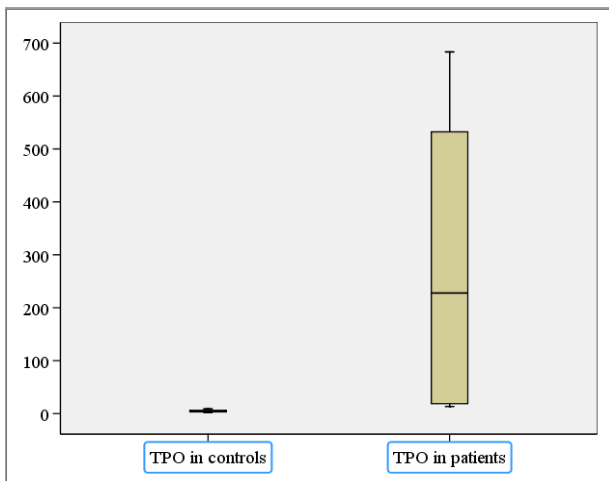


Figure 3: The Boxplot Graph of TPO of Controls and Goiter Patients

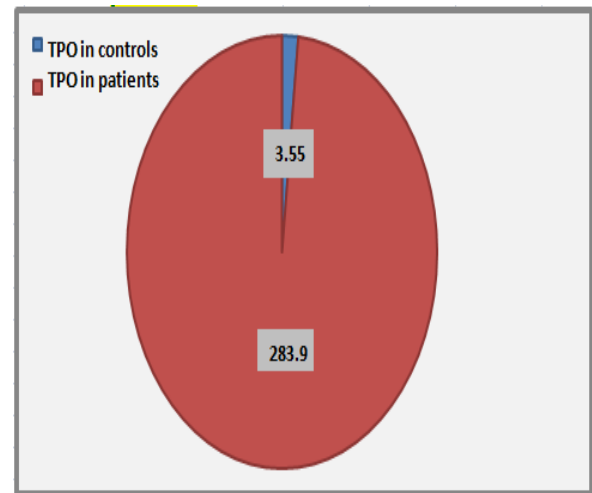


Figure 4: A Pie Chart of TPO of Controls and Goiter Patients

Table 4: Baseline Pearson Relation Coefficients of TPO Levels with Various Parameters (BMI, T4) in Goiter Patients Groups

Parameters		BMI	T4
TPO	Correlation	0.744	0.611
	P. Value	0.05*	0.06

Significant correlation using significance at * (P≤ 0.05)

While in Figure 1 we made a Box plot graph of T4 of controls and Goiter patients and in Figure 2 A pie chart of T4 of controls and Goiter patients.

Also there was a significant increased in TSH and Tpo in goiter patients as compared with control groups, as shown in Table 3. In addition, Figure 3 is a Boxplot graph of TPO of controls and Goiter patients and Figure 4 is a pie chart of TPO of controls and Goiter patients

There was Baseline Pearson relation coefficients of TPO levels with various parameters in Goiter patients groups as shown in Table 4.

These findings suggest that elevated levels of Thyroid-Stimulating hormone and lowered level of free Thyroxine proposed hypothyroidism disease. In addition of that decline of Thyroxine levels lead to enlargement of the thyroid gland (goiter) because of TSH continuous activation and cellular swelling.

Also low level of T4 could be result from disorder of iodide metabolism, or as adverse effect of drugs like paraminosalicylic acid, or can be by partial decreased of the enzymes required for Thyroxine biosynthesis, at this circumstances of continuous activation of TSH, increased thyroid cells population and levels of thyroid hormone constant that lead to development of a goiter¹⁰.

Patients with multinodular goiter could be detected by radioactive iodine followed by scanning of the thyroid gland, with evaluation of TSH, T4 and T3 hormones. The

disorder action of thyroid gland could lead to high expression of TSH with activation of the gland and development of goiter.

Furthermore, antibodies of interest such as thyroid stimulating antibodies and Anti-thyroperoxidase antibodies are found to be elevated in patients with thyroid disease¹¹.

These thyroid antibodies activation cause increased in patients with goiter¹² with lower expression of T4 and T3 hormone.¹³ In addition of that many studies suggest that risk of thyroid disease is affected by age and gender, where it is found increased with age and higher percentage in women than men¹⁴.

Furthermore iodotyrosine residues of thyroglobulin are activation by thyroperoxidase (TPO) enzyme in this reaction iodide oxidation to iodine and when decreased concentration of TPO lead to iodine deficiency and in this case could be development to goiter.¹⁵

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