Original Article

Prevalence of hyperthyroidism and hypothyroidism and its correlation with serum antithyroglobulin among patients in Kirkuk-Iraq

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ABSTRACT

A thyroid hormone biosynthesis disorder within the thyroid gland may lead to hyper or hypothyroidism. This study aimed to estimate the prevalence of thyroid problems in Kirkuk city and to find the correlation between anti-thyroglobulin (Anti-Tg) antibody and thyroid hormone levels. In this study, 88 patients with the age range of 20-50 years (20 males (44.75±14.51 years) and 68 females (39.91±13.66 years)) participated in the study. All biochemical analyses were measured according to immunofluorescent and ELISA assays. There was a significant decrease (P< 0.05) in T3 concentration in male patients as compared to females. In addition, there was a non-significant decrease (P <0.05) in TSH and T4 concentrations in male patients as compared to females. Hyperthyroidism was higher among the age group of (40-49 years), while hypothyroidism was higher among the age group of (30-39 years). At the same time, there was a non-significant decrease (P< 0.05) in the concentration of Ab in male patients as compared to female patients. Significant differences were observed between hyper and hypothyroid patients in the anti-thyroglobulin antibody distributed according to TSH levels. The elevation of the anti-Tg among patients with high T4 was higher (23.07%) than that of normal cases and those with low T4 levels. No significant differences (p< 0.293) were observed among patients with elevated anti-Tg and high T3 levels. It was concluded that there is a clear correlation between the anti-thyroglobulin level and the level of thyroid hormones.

Keywords: Antithyroglobulin, Hypothyroidism, Hyperthyroidism, T3, T4, TSH

Introduction

The thyroid gland is a large organ specialized in endocrine functions in the human body [1-3]. Two hormones, thyroxin (T4) and triiodothyronine (T3) are produced by this organ [2, 4, 5]. Thyroid disorder has many phases, ranging from early to advanced forms. According to the function parameters, patients with thyroid disorders are categorized as follows: "hypothyroidism", which refers to patients with low T4 levels, and "hyperthyroidism", which refers to patients with elevated T4 or T3 and decreased TSH [6, 7].

Hypothyroidism is considered one of the most common disorders in endocrine office practice [8]. It means a decrease in thyroid hormone [9, 10]. Hypothyroidism is a frequent disease, affecting women more than men [11]. The symptoms of hypothyroidism are fatigue, muscle swelling or cramps, loss of equilibrium, weight gain, loss of hair, cold intolerance,

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constipation, depression infrequent or thick menstruation, infertility, and bradycardia [12].

An over-concentration of thyroid hormones in tissues through their increased synthesis and over-release or an exogenous or endogenous extrathyroidal source is called hyperthyroidism [13]. Symptoms of hyperthyroidism are varying according to the illness duration, patient's age, and the magnitude of the excess hormones [14]. In the last decades, important diagnostic parameters such as anti-thyroid antibodies were introduced to evaluate the autoimmunity of thyroid dysfunction basis. Recent and past investigations have oriented to use anti-TG and anti-TPO to assess thyroid profile of suspected patients and manage treatment regiments [15, 16].

This study aimed to estimate and evaluate some parameters that affect the thyroid in Kirkuk city and to find the correlation between hyper and hypothyroidism with the serum anti-thyroglobulin.

Materials and Methods

This study was carried out at the clinical laboratory of Kirkuk General Hospital. Serum samples were collected from 88 patients (20 males and 68 females) during the period from January 2019 to June 2019. Their age ranged between 20-50 years old (20 males (44.75±14.51 years) and 68 females (39.91±13.66 years)).

The serum levels of T3, T4, and TSH were assessed using the immune-fluorometric technique (Vidas, Biomerieux co. France). Different levels of thyroid-stimulating hormone (TSH) levels indicated the following conditions: Euthyroidism: 0.25-5 µIU/ml; Hyperthyroidism: <0.15 µIU/ml; and Hypothyroidism: >7 µIU/ml. Triiodothyronine (T3) and thyroxine (T4) were determined according to normal ranges of (0.92-2.33 nmol/L) and (60-120 nmol/L), respectively.

The level of anti-thyroglobulin was measured using the enzyme-linked immunosorbent assay (ELISA) technique. The established reference range of the anti-thyroglobulin test kit is as follows: normal <20, elevated ≥20. Statistical data analysis was performed using the Chi-square test to confirm the significance level.

Results and Discussion

The diverse levels of TSH, T3, and T4 among the suspected patients in the present study revealed a significant decrease (P< 0.05) in T3 concentration in male patients as compared with female patients. Also, there was a non-significant decrease (P<0.05) in TSH and T4 concentrations in male patients as compared to female patients. At the same time, there was a non-significant decrease (P<0.05) in the concentration of antibodies in male patients as compared to female patients **(Tables 1 and 2)**. Elevated levels of anti-TG were observed among women, which were not significantly different from those of men (P-value = 0.107). This revealed a relationship between thyroid function test and thyroid antibody level [17].

Table 1. The levels of TSH, T3, and T4 in sera of patients and concentration of anti-Tg distributed according to gender.

Parameters	Mean±SD		P-value
	Male (N=20)	Female (N=68)	NS
Con. of Ab	22.39±62.96	31.62±72.28	NS
Age	44.75±14.51	39.91±13.66	NS
TSH (µIU/L)	4.18±13.22	9.37±17.08	NS
T3 (nmol/ml)	9.60±26.60	3.87±7.14	P <0.05 (S)
T4 (nmol/ml)	105.17±55.32	105.89±63.55	NS

P-value = (p <0.05), Con. of Ab.: concentration of antibody, T3= Triiodothyroxine, T4= Thyroxine, TSH= Thyroid-stimulating hormone.

Table 2. The levels of TSH, T3, and T4 and concentration of Anti-Tg Ab in sera of patients.

Parameters	N	Range	Minimum	Maximum	Mean	Std. Deviation
Con. of Ab	88	271.775	0.225	272.000	29.53036	70.035784
Age	88	55	18	73	41.01	13.925
TSH(µIU/L)	88	59.95	0.05	60.00	8.1965	16.36236
T3(nmol/ml)	88	120.620	0.380	121.000	5.17551	14.131724
T4(nmol/ml)	88	315.61	4.39	320.00	105.7289	61.47845

P-value = (p<0.05), Con. of Ab.: concentration of antibody, T3=Triiodothyroxine, T4=Thyroxine, TSH=Thyroid stimulating hormone.

Table 3 shows that hyperthyroid and hypothyroid patients accounted for about 23.8% and 22.7% of the total patients, respectively. Thyroid diseases were higher among females than in males. During the Second World War in Denmark, the mean incidence of hyperthyroidism was 25.8% [18], while in Iraq the incidence was 14% [16]. This finding agrees with studies done by Shakir *et al.* [19]. Hyperthyroidism is considered to be a common disorder [20]; a report by Tunbridge *et al.* [21] done 30 years ago showed a prevalence of around 2.7% in females (10-fold less in males) for the general population in the United Kingdom.

Table 3. Distribution of thyroid disorders according to gender

Groups	Thyroid disorders			total	P-value
	Euthyroid (%)	Hyperthyroid (%)	Hypothyroid (%)		
Male	15	4	1	20	
Female	32	17	19	68	P<0.05
Total	47(53.4)	21(23.8)	20 (22.7)	88	

As shown in **Table 4**, hyperthyroidism was higher among the age group of (40-49 years), while hypothyroidism was more prevalent among the age group of (30-39 years). The TSH percentage increases progressively with age in both genders as established by Vadiveloo *et al.* [22]. The present result agrees with a study done by Kalk who clarified that there is a high incidence years among females ranging from 1:5 to 1:10 [23].

Table 4. Distribution of thyroid disorders according to age groups

Ages (year)	N	No. Hyper. (%)	No. Hypo. (%)	No. Eu. (%)
20-29	22	5 (22.7)	4 (18.1)	13 (59.09)
30-39	25	5 (20)	8 (32)	12 (48)
40-49	17	6 (35.2)	4 (23.5)	7 (41.1)
50-59	13	3 (23)	2 (15.3)	8 (61.5)
60<	11	2 (18.1)	2 (18.1)	7 (63.6)
Total (%)	88 (100)	21(23.8)	20 (22.7)	47 (53.4)

Significant differences of 13 patients were observed when the anti-thyroglobulin distributed according to TSH levels in both hyper and hypothyroid patients **(Table 5)**. In a study, there were no significant differences observed when the level of anti-thyroid peroxidase measured according to the level of TSH [19]. In a study done by Ali *et al.* [24] there was a significant and moderately linear relationship between anti-Tg and TSH levels. Anti-Tg antibodies showed a great correlation with TSH at >60%. They suggested that there is a correlation between elevated levels of TSH with thyroid hormones among patients, in general, as well as autoimmune thyroid dysfunctions.

Table 5. Distribution of elevated anti-thyroglobulin (Ab) according to TSH levels.

TSH	No. of patients with Elevated Ab	No. of patients	%	P-value vs. Euthyroid
Euthyroid	2	47	4.25	
Hyperthyroid	5	21	23.8	0.021
Hypothyroid	6	20	30	0.036
Total	13	88		

Table 6 shows that the elevation of the anti-Tg among patients with high T4 was higher (23.07%) than normal and low T4 level patients. Analysis of the anti-Tg with T4 manifested a low regression correlation (R=0.5823) [24].

Table 6. Distribution of elevated anti-thyroglobulin Ab according to T4 levels.

T4	No. of patients with Elevated Ab	No. of patients	%	P-value vs. Normal
Normal	6	48	12.5	
Low	1	14	7.14	0.03
High	6	26	23.07	1
Total	13	88		

As shown in **Table 7**, no significant differences (p<0.293) were observed among patients with elevated anti-Tg and high T3 levels. Comparative grouping of T3 with anti-Tg revealed lower levels of regression correlation (R=0.2516) [24].

Table 7. Distribution of elevated anti-thyroglobulin (Ab) according to T3 levels.

T3	No. of patients with Elevated Ab	No. of patients	%	P-value vs. Normal
Normal	7	47	14.9	
Low	0	8	0	0.014
High	6	33	18.18	0.293
Total	13	88		

Conclusion

In conclusion, there is a clear correlation between thyroid hormone levels and anti-thyroglobulin levels. This elaborates on the importance of thyroid antibodies as an indicator in clinical examination and follow-up of patients with autoimmune thyroid disorders.

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