

A Comparison Thyroid Function Test Between Patient Group and Control Group Among Women Had Thyroid Disorders

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ABSTRACT

Background: Thyroid disorders are more common in women, and it is associated with infertility, menstrual irregularities, and pregnancy loss among women of childbearing age.

Objectives: Comparison thyroid function test between patient group and control group among women had thyroid disorders.

Materials and methods: A sample of a case-control study consisting of (100) clients from two hospitals in Salah al-Din Governorate/Iraq. The study was conducted during the period from (31th of October 2021 to 2th of August 2022) included obtaining a blood sample for thyroid function tests. Data were analyzed using SPSS software v.25.0 and Microsoft office 2010.

Results: The results of the study showed hypothyroidism mean \pm std (TSH (19.458 \pm 8.250), freeT3(1.374 \pm 0.623), freeT4(8.746 \pm 1.875) for both TSH, f T3 and f T4 P-value 0.05< 0.0001) compared with control group, hyperthyroidism (TSH (0.095 \pm 0.059), freeT3(10.828 \pm 3.089), freeT4(28.303 \pm 3.137) for both TSH, f T3 and f T4 P-value 0.05< 0.0001) compared with control group, subclinical hyperthyroidism (TSH(0.221 \pm 0.045, p- value 0.05 < 0.0001), freeT3(3.945 \pm 1.102), freeT4(16.035 \pm 1.579) p-value 0.05> 0.7, 0.9 respectively compared with control group, subclinical hypothyroidism (TSH(7.889 \pm 1.900, p- value 0.05 < 0.0001), freeT3(3.893 \pm 1.060), freeT4(15.281 \pm 1.927) p-value 0.05> 0.06, 0.3 respectively compared with control group.

Conclusions: There was a very high statistical significance with hypothyroidism and hyperthyroidism for both TSH, free T3 and T4 compared to control group, and also there was a very high statistical significance with subclinical hypothyroidism and subclinical hyperthyroidism for TSH, while no statistically significant for f T3 and f T4 compared to control group.

Recommendations: The study advises all women with thyroid disorders to treat them of all kinds because of their impact on all body functions.

Keywords: Thyroid disorders, Reproductive age group.

INTRODUCTION

The thyroid gland is an endocrine gland located below the larynx in the lower front part of the neck. The normal function of the thyroid gland is to produce hormones and pump them into the blood. These hormones are useful in the body for regulating heart rate, body temperature, metabolism and blood pressure, and for maintaining the muscles and heart, brain and other organs working efficiently, any imbalance in these hormones affects many functions of the body, including the female reproductive system ⁽¹⁾. Thyroid problems are among the most common endocrine dysfunction in the world, which affecting ten times the women than men ⁽²⁾. In addition, thyroid disorders are the second most prevalent metabolic disorders after diabetes in the world ⁽³⁾. Hypothyroidism (underactive thyroid gland) is characterized by an elevated TSH level, with a thyroid hormones deficiency. It is one of the more common pathological conditions in the global ⁽⁴⁾. An estimated, 3.7 percent of the total US population is affected by hypothyroidism depend on the National Nutrition and Health Examination Survey ⁽⁵⁾. In Iraq, about 14.5percent of women suffer from hypothyroidism, while there are about third of women with non-toxic goiters ⁽⁶⁾. Subclinical hypothyroidism is defined as an elevated thyrotropin (S.TSH) level with normal serum free triiodothyronine (FT3) and free thyroxine (FT4) levels, accompanied with little or no symptoms and signs of hypothyroidism. Any S.TSH value higher than 4.6 mIU/ml reference to the diagnosis of subclinical hypothyroidism and should be considered abnormal ⁽⁷⁾. Subclinical hypothyroidism is about 4-15percent in worldwide where as in India it is reported to being 11.4percent for women ⁽⁸⁾. Hyperthyroidism is defined as a clinical condition characterized by inappropriately high tissue thyroid hormone concentrations with low thyroid-stimulating hormone concentration. The prevalence of hyperthyroidism was estimated ranges from 0.1percent to 2.9percent worldwide also is approximately 1.2percent (0.7percent subclinical and 0.5percent overt) in the United States ⁽⁹⁾. Subclinical hyperthyroidism is a biochemical diagnosis characterized by a reduced serum TSH concentration, with normal serum triiodothyronine (T3) and thyroxine (T4) concentrations regardless of the absence or presence of symptoms ^(10,11,12,13). The prevalence of subclinical

hyperthyroidism among Iraqi population in Baghdad city in women was about (81.7%), while in men (18.3%) ^(14,15,16,17).

MATERIALS AND METHODS

It was a hospital-based case-control descriptive type of observational study conducted at Al-Shirqat General Hospital and Salah Al-Din General Hospital in Salah Al-Din Governorate/Iraq. Duration of the study was conducted from 31th of October 2021 to 2th of August 2022. One hundred women who presented to the surgical consultation clinic, medical consultation clinic, and the obstetrics and gynecology consultation clinic. All women in 15-45 years of age group from 50 women with thyroid dysfunction and 50 women in control group and those giving agreement. Inclusion criteria, women who age between (15-45) years old, married and single, and women who suffer from symptoms and signs of thyroid gland dysfunction or suspected with the symptoms favoring the thyroid disorders. The exclusion criteria were women with age less than 15 and more than 45 years old, women on thyroid replacement therapy, patients with goiter, but thyroid function test negative, and women with euthyroid. By purposive sampling design. Data were collected during a face-to-face interview by using of a questionnaire in the present study included the Socio-demographic data of the participants (age, education level, residence type, marital status, parity and height and weight were measured to calculate BMI), If she suffered from an enlarged thyroid gland and symptoms and signs of thyroid gland, and the latter is divided into two parts: first, symptoms and signs of hypothyroidism, and secondly, symptoms and signs of hyperthyroidism, Age of menarche per a year, menstrual cycle regularity is either regular or irregular, and pattern of menstrual cycle, whether normal or abnormal, interpretation of thyroid function, which included: Hypothyroidism, subclinical hypothyroidism, hyperthyroidism, subclinical hyperthyroidism and the result of the examination is normal (which does not suffer from thyroid disorders) in control group, and thyroid hormone testing which included: normal value TSH (0.3-4.2 mIU/L), free T3 (2.8-7.1 pmol/L), and free T4 (12-22 pmol/L). These tests were done in random blood samples as the difference in TSH secretion

related to circadian rhythm is small and does not affect the timing of blood sampling.

Statistical Analysis: The data analysis was done by using IBM SPSS(Statistical Package for Social Sciences) program (version 25.0) and Microsoft office 2010. The descriptive statistics was used to calculate frequency and percentage, and (mean ± standard deviation) at 0.05 level of significance.

Table 1: Distribution of the Study Sample according to the Socio-demographic Data.

Demographic Data	Groups	Case Group		Control Group	
		Freq.	%	Freq.	%
Age	≤ 20y	3	6.0	15	30.0
	21-30y	14	28.0	11	22.0
	31-40y	23	46.0	9	18.0
	>40y	10	20.0	15	30.0
	Total	50	100.0	50	100.0

This table shows the socio-demographic data of the study sample. In present study 50 cases were taken and 46% were found to be between 31-40 years, followed by 28% were in the age group 21-30 years in case group, with 50 control group were taken, 30% were in the age group less or equal to 20 years, followed by 30% were in the age group more than 40 years (Table 1).

Table 2: Clinical Thyroid Gland Enlargement Distribution in Study Sample.

Demographic Data	Groups	Case Group		Control Group	
		Freq.	%	Freq.	%
Do you suffer from enlarged thyroid gland (goiter)	Present	21	42.0	0	0.0
	Absent	29	58.0	50	100.0
	Total	50	100.0	50	100.0

In thyroid gland enlargement, in case group (42%) were present goiter, while in the control group (0%) were present goiter (Table 2).

Table 3.1: Distribution of Study Participants regarding Symptoms and Signs of Hypothyroidism.

Hypothyroidism	Groups	Case Group		Control Group	
		Freq.	%	Freq.	%
Weight gain	No	20	40.0	29	58.0
	Yes	30	60.0	21	42.0
	Total	50	100.0	50	100.0
Muscle cramps	No	23	46.0	42	84.0
	Yes	27	54.0	8	16.0
	Total	50	100.0	50	100.0
Cold intolerance	No	21	42.0	44	88.0
	Yes	29	58.0	6	12.0
	Total	50	100.0	50	100.0
Hair fall, dry hair	No	21	42.0	29	58.0
	Yes	29	58.0	21	42.0
	Total	50	100.0	50	100.0
Puffy face	No	26	52.0	49	98.0
	Yes	24	48.0	1	2.0
	Total	50	100.0	50	100.0
Decreased libido	No	38	76.0	47	94.0
	Yes	12	24.0	3	6.0
	Total	50	100.0	50	100.0
Weakness	No	18	36.0	40	80.0
	Yes	32	64.0	10	20.0
	Total	50	100.0	50	100.0
Dry, rough pale skin	No	26	52.0	37	74.0
	Yes	24	48.0	13	26.0
	Total	50	100.0	50	100.0
Irregular periods or heavy periods	No	16	32.0	42	84.0
	Yes	34	68.0	8	16.0
	Total	50	100.0	50	100.0
Fatigue	No	17	34.0	35	70.0
	Yes	33	66.0	15	30.0
	Total	50	100.0	50	100.0
Constipation	No	26	52.0	44	88.0
	Yes	24	48.0	6	12.0
	Total	50	100.0	50	100.0
Depression	No	36	72.0	37	74.0
	Yes	14	28.0	13	26.0
	Total	50	100.0	50	100.0

Most of the study participants in case group had irregular periods or heavy periods (68%), fatigue (66%), weakness (64%), weight gain (60%), cold intolerance (58%) and hair fall, dry hair (58%), turned out to be hypothyroidism when investigated biochemically, while in the control group higher percentage had weight gain (42%), hair fall, dry hair (42%), and fatigue (30%) (Table (3.1)).

Table 3.2: Distribution of Study Participants regarding Symptoms and Signs of Hyperthyroidism.

Hyperthyroidism	Groups	Case Group		Control Group	
		Freq.	%	Freq.	%
Heat intolerance	No	38	76.0	40	80.0
	Yes	12	24.0	10	20.0
	Total	50	100.0	50	100.0
Hypertension	No	42	84.0	35	70.0
	Yes	8	16.0	15	30.0
	Total	50	100.0	50	100.0
Tremor	No	38	76.0	39	78.0
	Yes	12	24.0	11	22.0
	Total	50	100.0	50	100.0
Irritability	No	33	66.0	43	86.0
	Yes	17	34.0	7	14.0
	Total	50	100.0	50	100.0
Eye signs	No	39	78.0	50	100.0
	Yes	11	22.0	0	0.0
	Total	50	100.0	50	100.0
Increased appetite	No	37	74.0	33	66.0
	Yes	13	26.0	17	34.0
	Total	50	100.0	50	100.0
Changes in menstrual	No	14	28.0	41	82.0
	Yes	36	72.0	9	18.0
	Total	50	100.0	50	100.0
Weight loss	No	33	66.0	37	74.0
	Yes	17	34.0	13	26.0
	Total	50	100.0	50	100.0
Sweating	No	34	68.0	33	66.0
	Yes	16	32.0	17	34.0
	Total	50	100.0	50	100.0
Skin thinning	No	41	82.0	42	84.0
	Yes	9	18.0	8	16.0
	Total	50	100.0	50	100.0
Difficulty sleeping	No	46	92.0	39	78.0
	Yes	4	8.0	11	22.0
	Total	50	100.0	50	100.0
Fine, brittle hair	No	41	82.0	30	60.0
	Yes	9	18.0	20	40.0
	Total	50	100.0	50	100.0
Palpitations	No	38	76.0	26	52.0
	Yes	12	24.0	24	48.0
	Total	50	100.0	50	100.0
Changes in bowel patterns	No	38	76.0	42	84.0
	Yes	12	24.0	8	16.0
	Total	50	100.0	50	100.0

Table 4: Distribution of Thyroid Profile (T3, T4 and TSH).

Thyroid profile	Groups	Case Group		Control Group	
		Freq.	%	Freq.	%
Thyroid stimulating hormone	(0.3-4.2) m IU/l normal	0	0	50	100.0
	<(0.3-4.2)m IU/l	16	32.0	0	0.0
	>(0.3-4.2)m IU/l	34	68.0	0	0.0
	Total	50	100.0	50	100.0
Free T3	(2.8-7.1) pmol/L	28	56.0	50	100.0
	<(2.8-7.1) pmol/L	13	26.0	0	0.0
	>(2.8-7.1) pmol/L	9	18.0	0	0.0
	Total	50	100.0	50	100.0
Free T4	(12-22) pmol/L	28	56.0	50	100.0
	<(12-22) pmol/L	13	26.0	0	0.0
	>(12-22) pmol/L	9	18.0	0	0.0
	Total	50	100.0	50	100.0

Most of the study participants in case group had changes in menstrual cycle (72%), irritability (34%), weight loss (34%), sweating (32%), and increased appetite (26%), turned out to be hyperthyroidism when investigated biochemically, while in the control group higher percentage of participants had palpitations

(48%), fine, brittle hair (40%), sweating (34%), and increased appetite (34%)(Table (3.2)).

This table shows thyroid function test, in the case group (68%) had TSH in higher ranges, and (32%) had TSH in lower ranges, while in the control group (100%) having TSH within normal range. As for the free T3 and T4 are about (56%) within normal range, (26%) less than reference range, and (18%) greater than reference range in the case group, while in control group (100%) having normal reference range of free T4 and T3 levels (Table 4).

Table 5: A Comparison Thyroid Function Test between Patient Group and Control Group among Women had Hypothyroidism.

Parameter	Hypothyroidism patient:13 mean ± std n: 13	Control mean ± std n:13	P- value
TSH	19.458±8.250	2.396±0.886	0.0001
FT3	1.374±0.623	4.009±1.065	0.0001
FT4	8.746±1.875	16.1±2.347	0.0001

This table shows that there was very highly statistically significant differences between patients had hypothyroidism and healthy people, p- value 0.05 < 0.0001 for both TSH, freeT3 and T4 tests at significance level p- 0.05 as shown (Table 5).

Table 6: A Comparison Thyroid Function Test between Patient Group and Control Group among Women had Hyperthyroidism.

Parameter	Hyperthyroidism patient mean ± std n: 9	Control mean ± std n:9	P- value
TSH	0.095±0.059	2.17±1.042	0.0001
FT3	10.828±3.089	4.501±1.236	0.0001
FT4	28.303±3.137	16.023±2.155	0.0001

This table shows that there was very highly statistically significant differences between patients had hyperthyroidism and healthy people, p- value 0.05 < 0.0001 for both TSH, freeT3 and T4 tests at significance level p- 0.05 as shown (Table 6).

Table 7: A Comparison Thyroid Function Test between Patient Group and Control Group among Women had Subclinical Hyperthyroidism.

Parameter	Subclinical hyper patient mean ± std n: 7	Control mean ± std n:7	P- value
TSH	0.221±0.045	2.178±0.922	0.0001
FT3	3.945±1.102	4.125±1.335	0.7
FT4	16.035±1.579	15.964±3.110	0.9

This table shows that there was very highly statistically significant differences between patients had subclinical hyperthyroidism and healthy people at TSH test, p- value 0.05 < 0.0001 while no statistically significance at free T3 and T4 tests p- value 0.05> 0.7, 0.9 respectively at significance level p- 0.05 as shown (Table 7).

Table 8: A Comparison Thyroid Function Test between Patient Group and Control Group among Women had Subclinical Hypothyroidism.

Parameter	Subclinical hypo patient mean ± std n: 21	Control mean ± std n:21	P- value
TSH	7.889±1.900	1.871±0.955	0.0001
FT3	3.893±1.060	4.595±1.314	0.06
FT4	15.281±1.927	15.941±2.531	0.3

This table shows that there was very highly statistically significant differences between patients had subclinical hypothyroidism and healthy people at TSH test, p- value 0.05 < 0.0001 while no statistically significance at free T3 and T4 tests p- value 0.05> 0.06, 0.3 respectively at significance level p- 0.05 as shown (Table 8).

DISCUSSION

The thyroid disorders in general and hypothyroidism in particular are the common causes of menstrual disturbances in women.

They include age of menarche, menstrual cycles, fetal development and fertility, pubertal growth and development, reproductive age, postpartum period, and postmenopausal age (Gungor et al., 2016).

In the present study, it has been taken reproductive age group patients between 15-45 years and observed an association between thyroid dysfunction for different age groups. Majority of patients (n=100) of case group in age group 31-40 years 46% followed by 28% were in the age group 21-30 years compared with control group 30% were for both the age groups less or equal to 20 years, as well as more than 40 years as shown (Table 1). These results are in agreement with the study conducted by (18), in Enam Medical Hospital, Dhaka, Bangladesh, where the highest percentage of participants was 50.34% in the age group (31-40) years, followed by 26.90% in age group (21-30) years. Thus, the results of this study approximately disagree with the results of (19), in KIM's medical college, it reached a rate of (40%) in the age group (25-31) years and (31%) in the group (32-39). The difference between these two studies is in the study (Lakshmi et al., 2020) she used the method of the prospective analytical study, on patients without obvious symptoms, in addition to the difference in a sample size, while in present study we used a case-control study, on newly discovered cases who had symptoms and signs or suspected symptoms related to thyroid dysfunction.

In the present study, out of 50 patients with thyroid gland dysfunction, 42% have enlarged thyroid gland compared with control group 0% as shown (Table 2). The current study agrees with the study conducted by (20,21,22), in Kalinga Institute of Medical Sciences and Hospital, Odisha, where it found out of 56 patients with thyroid gland dysfunction, 44.6% have goiter.

In the current study, it has been that observed the majority of patients with hypothyroidism suffering from irregular periods or heavy periods (68%), fatigue (66%), weakness (64%), weight gain (60%), cold intolerance (58%) and hair fall, dry hair (58%), compared with control group higher percentage had participants were weight gain (42%), hair fall, dry hair (42%), and fatigue (30%) as shown (Table (3.1)). The present study agrees with the study conducted by (23), which reached the same results (weight gain (40%), weakness (26%), fatiguability (34%), cold intolerance (24%), hair fall/dry hair(20%)).

In the present study, it has been that observed the majority of patients with hyperthyroidism suffering from changes in menstrual (72%), irritability (34%), weight loss (34%), sweating (32%), and increased appetite (26%), compared with control group higher percentage had participants were palpitations (48%), fine, brittle hair (40%), sweating (34%), and increased appetite (34%) as shown (Table (3.2)). The results of this study agree with the results of the study (Verma et al., 2017), which found the most symptoms with hyperthyroidism, respectively like heat intolerance, tachycardia, weight loss, ..etc.

In the present study, by examining thyroid function, it has been found 68% of the participants with high TSH and 32% with low TSH compared with control group 100% with normal reference, and as for free T3 and free T4, about 56% with the normal range, 26% less than normal range and (18%) greater than reference range, compared with control group was within normal range as shown (Table 4). The present study agrees with the study conducted by (Lakshmi et al., 2020), which reached the same results: TSH high 46%, TSH low 5.5%, and TSH normal 48.5%, free T4 and T3 high 5.5%, low 23.5% and normal 70.5%.

In the present study, in case group the mean and standard deviation values for TSH were 19.458±8.250 compared to control group were 2.396±0.886, in case group the mean and standard deviation values for freeT3 were 1.374±0.623 compared to control group were 4.009±1.065, and also in case group the mean and standard deviation values for FT4 8.746±1.875 compared to control group were 16.1±2.347, there was very highly statistically significant differences between patients having hypothyroidism and healthy people, p- value 0.05 < 0.0001 for both TSH, freeT3 and T4 tests at significance level p- value 0.05 as shown (Table 5). The

present study agrees with the study^(24,25) at Medical College in Jagdalpur where the mean and standard deviation values were 15.38 ± 11.40 for TSH, 0.43 ± 0.25 for T3 and 3.80 ± 1.82 for T4, P-value $0.05 < 0.0001$ for both TSH, T3, and T4.

In the present study, in case group the mean and standard deviation values for TSH were 0.095 ± 0.059 compared to control group were 2.17 ± 1.042 , in case group the mean and standard deviation values for FT3 were 10.828 ± 3.089 compared to control group were 4.501 ± 1.236 , and also in case group the mean and standard deviation values for free T4 were 28.303 ± 3.137 compared to control group were 16.023 ± 2.155 , there was very highly statistically significant differences between patients had hyperthyroidism and healthy people, p-value $0.05 < 0.0001$ for both TSH, freeT3 and T4 tests at significance level p- 0.05 as shown (Table 6). The present study agrees with the study^(26,27) conducted in the outpatient department of UNTH, Enugu, Nigeria. where the values of mean and standard deviation were 0.31 ± 0.21 for TSH, 3.38 ± 1.93 for f T3 and 2.17 ± 1.56 for f T4, P-value $0.05 < 0.0001$ * for both TSH, T3, and T4.

In the present study, in case group the mean and standard deviation values for TSH were 0.221 ± 0.045 compared to control group were 2.178 ± 0.922 , in case group the mean and standard deviation values for FT3 were 3.945 ± 1.102 compared to control group were 4.125 ± 1.335 , and also in case group the mean and standard deviation values for free T4 were 16.035 ± 1.579 compared to control group were 15.964 ± 3.110 , there was very highly statistically significant differences between patients had subclinical hyperthyroidism and healthy people at TSH test, p-value $0.05 < 0.0001$ while no statistically significance at free T3 and T4 tests p-value $0.05 > 0.7, 0.9$ respectively at significance level p-0.05 as shown (Table 7). From the researcher's point of view, there was no significant difference in fT3 and fT4 between cases and controls because the effect is only on thyroid-stimulating hormone while thyroid hormones are normal^(28,29).

In the present study, in case group the mean and standard deviation values for TSH were 7.889 ± 1.900 compared to control group were 1.871 ± 0.955 , in case group the mean and standard deviation values for FT3 were 3.893 ± 1.060 compared to control group were 4.595 ± 1.314 , and also in case group the mean and standard deviation values for free T4 were 15.281 ± 1.927 compared to control group were 15.941 ± 2.531 , there was very highly statistically significant differences between patients had subclinical hypothyroidism and healthy people at TSH test, p-value $0.05 < 0.0001$ while no statistically significance at free T3 and T4 tests p-value $0.05 > 0.06, 0.3$ respectively at significance level p- 0.05 as shown (Table 8). The present study agrees with the study of⁽³⁰⁾, which reached the same results as, the mean and standard deviation values for TSH 7.0 ± 2.1 at significance level p-0.05 < 0.001.

CONCLUSIONS

The group most affected by thyroid gland dysfunction is (31-40) years old. This result is unexpected as it was not previously recorded in Salah Al-Din Governorate compared with control group, it ranged between two age groups less than or equal to 20 years, as well as more than 40 years. Most of the common symptoms and signs of hypothyroidism were irregular periods or heavy periods, fatigue, weakness, weight gain, cold intolerance, and hair loss, dry hair compared with control group higher percentage of participants were weight gain, hair fall, dry hair, and fatigue, while with hyperthyroidism were changes in menstrual, irritability, weight loss, sweating and increased appetite compared with control group higher percentage of participants were palpitations, fine, brittle hair, sweating, and increased appetite, and some patients had an enlarged thyroid gland compared with control group who did not have a goiter.

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