

The Impact of Hypothyroidism in Some Reproductive Hormones in Women in Maysan Province

Eman Kamil Aati¹, Zainab Abduljabbar Ridha Al-Ali^{2*}

Abstract

Background: Hypothyroidism is a common endocrine disorder, resulting from insufficient production of thyroid hormones. It is affect metabolism of sex steroids and ovarian function in women. **Methods:** This study was conducting on 88 women in reproductive age (20-35) years who reviewed Al-Sader Teaching Hospital and the Diabetes and Endocrine Center in Maysan city .Women divided in to four groups as the following: group A (Control group), group B(Infertility women), group C (Women with hypothyroidism) and group D (Women with hypothyroidism and infertility) . Thyroid and reproductive hormones measurements were done by the Chemiluminescent Automates Immunoassay System. **Results:** The results showed: the values of TSH increased significantly ($P<0.05$) in the C (hypothyroidism women) and D(hypothyroidism and infertility women) groups, while T3 and T4 results show decreased significantly($P<0.05$) in the C(hypothyroidism women) and D(hypothyroidism and infertility women) groups . The results showed that FSH values significant increase in the D(infertile women with hypothyroidism) group, LH values did not differ significantly among four groups ,while progesterone values showed significant decrease in the C(fertile women with hypothyroidism) and D(infertile women with hypothyroidism) groups , E2 values significant increase in the B (infertile women) and C(fertile women with hypothyroidism) groups and decrease in the D (infertile women with hypothyroidism) group in comparison with A (control)group.

Keywords: hypothyroidism, reproductive hormones, women.

¹ College of Nursing, University of Misan, Maysan, Iraq

² Department of Biology, College of Science, University of Misan, Maysan, Iraq

*Correspondence: zainab-alali@uomisan.edu.iq

Introduction

The thyroid gland is one of the largest endocrine glands that found in the body, this gland is located in the neck in front of the thyroid cartilage (in men it's also known the Adam's apple) and at about the same level

as the cricoid cartilage [1]. The thyroid gland mobilizes nutritional iodine, making it an organic compound that can accelerate the procedures of metabolism, it is essential to growth and functioning to all body cells [2]. Thyroid hormones (THs) play a critical role in differentiation, development, and metabolism. In fact, THs are needed for almost all tissues to operate normally, with significant impacts on oxygen consumption and metabolic rate [3].

Disorders of the thyroid is usually acquired and can occur at any time in life. Hypothyroidism manifestations may be triggered by an iodine deficiency and subsequent absence of precursor moods for hormonal drugs (easy hyperplastic goiter characterized by gland compensatory enlargement), thyrotropic factor deficiency or other metabolic irregularities, adding iodine to the diet or administering thyrotropin, respectively, can correct the first two causes. Naturally, thyroid hormone replacement treatment may be used for deficiencies of any origin [4].

Hypothyroidism has been associated with altered ovarian ability, menstrual abnormalities, subfertility, and higher (intermittent) abnormal birth cycle rates, recommending that thyroid hormone affects female reproductive axis [5]. The current study aimed to investigate some reproductive hormones in fertile and infertile women with hypothyroidism.

Material and Methods

Population of study

The population of this study consists of 88 women with average age between 20-35 years ,divided into four groups and each group include 22 women as the following:

- First group(A) (control group) (healthy women with regular menstrual cycles without any hormonal disturbances).
- Second group (B) (infertile women with hormonal disturbance).
- Third group (C) (fertile women with hypothyroidism).
- Fourth group (D) (infertile women with hypothyroidism).

Collection of Blood Sample

Five milliliters of the blood was obtained from the women in the follicular phase (2-3) day of the menstrual cycle at 8-10 a.m. by a medical syringe for measurement of T3,T4 and TSH and reproductive hormones (FSH, LH, Progesterone and E2) of each subject (patients and controls woman). The blood sample puts in gel tube for 20 minutes at room temperature for clotting . Then, centrifugation was done at 3000 rpm for 10 minutes to collect the serum .

Methods

Hormonal Parameters Assesment :Concentration of hormonal levels (thyroid hormones and reproductive hormones) measured by the chemiluminescent automates immunoassay system (Cobas e 411, Roche diagnostic , Germany).

Ethical considerations

Permission to conduct this study was issued by the Health Institutional Committee at Al-Sader Teaching Hospital and the Diabetes and Endocrine Center in Maysan province, and the samples were taken from patients under the supervision of professional health-care workers.

Statistical analysis

The data obtained during the current study were analyzed statistically to determine the significance of the different parameters by ANOVA. The comparisons between means were made using least significant differences, and the data were presented as mean $\pm$ standard deviation.

Results

Thyroid hormones

The values of T3 decreased significantly ($P \leq 0.05$) in C (1.67 ± 0.41 nmol/L) and D (1.67 ± 0.45 nmol/L) groups compare with A (2 ± 0.05 nmol/L) and B (1.95 ± 0.33 nmol/L) groups. A group did not differ significantly in comparison with B group. No significant differences between C and D groups. The values of T4 decreased significantly ($P \leq 0.05$) in C (94.75 ± 21.62 nmol/L) and D (87.81 ± 22.81 nmol/L) groups compare with A (102.23 ± 25.85 nmol/L) and B (109.29 ± 16.46 nmol/L) groups. A group did not differ significantly in comparison with B group. No significant differences between C and D groups. The values of TSH in the D (13.61 ± 2.37 uIU/mL) group increased significantly ($P \leq 0.05$) in comparison with A (1.85 ± 0.50 uIU/mL), B (1.86 ± 1.03 uIU/mL) and C (3.31 ± 1.06 uIU/mL) groups. C group higher significantly in comparison with A and B groups, but no significant differences between A and B groups (Table 1).

Table 1. The Values of Serum Thyroid Hormones in Control , Infertility , Hypothyroidism ,and hypothyroidism and Infertility women

Groups	TSH uIU/mL	T3 nmol/L	T4 nmol/L
Group-A	1.85 ± 0.50^a	2.009 ± 0.50^a	102.23 ± 25.85^a
Group-B	1.86 ± 1.03^a	1.95 ± 0.33^a	109.29 ± 16.46^a
Group-C	3.31 ± 1.06^b	1.67 ± 0.41^b	94.75 ± 21.62^b
Group-D	13.61 ± 2.37^c	1.67 ± 0.45^b	87.81 ± 22.81^b

N=22 in each group, Values represent mean $\pm$ SD, Different letters refer to a significant differences among groups at level of ($P < 0.05$). Similar letters refer to non-significant differences among groups. GA=healthy group (control). GB=Women with infertility. GC=Women with hypothyroidism and fertility. GD=Women with hypothyroidism and infertility.

Reproductive Hormones

The values of FSH in the D (10.11 ± 1.01 m.lu/mL) group increased significantly ($P \leq 0.05$) in comparison with A (7.11 ± 0.82 m.lu/mL), B (6.16 ± 0.44 m.lu/mL) and C (8.31 ± 0.74 m.lu/mL) groups. B group decreased significantly ($P \leq 0.05$) in comparison with A and C groups. No significant differences between A and C groups (Figure 1).

The values of LH did not differ significantly ($P > 0.05$) in the A (6.41 ± 2.36 m.lu/mL), B (6.84 ± 2.53 m.lu/mL), C (5.30 ± 1.45 m.lu/mL) and D (5.90 ± 1.47 m.lu/mL) groups respectively (Figure 2).

The values of Progesterone decreased significantly ($P \leq 0.05$) in C (0.15 ± 0.01 ng/mL) and D (0.21 ± 0.02 ng/mL) groups compare with A (0.39 ± 0.08 ng/mL) and B (0.35 ± 0.02 ng/mL) groups. A group did not differ significantly in comparison with B group. C group decreased significantly ($P \leq 0.05$) in comparison with D group (Figure 3).

The values of E2 in the C (56.19 ± 6.70 Pg/mL) group increased significantly ($P \leq 0.05$) in comparison with A (37.79 ± 4.79 Pg/mL), B (43.14 ± 4.26 Pg/mL) and D (32.94 ± 4.31 Pg/mL) groups. B group increased significantly in comparison with A and D groups. No differences significantly between A and D groups (Figure 4).

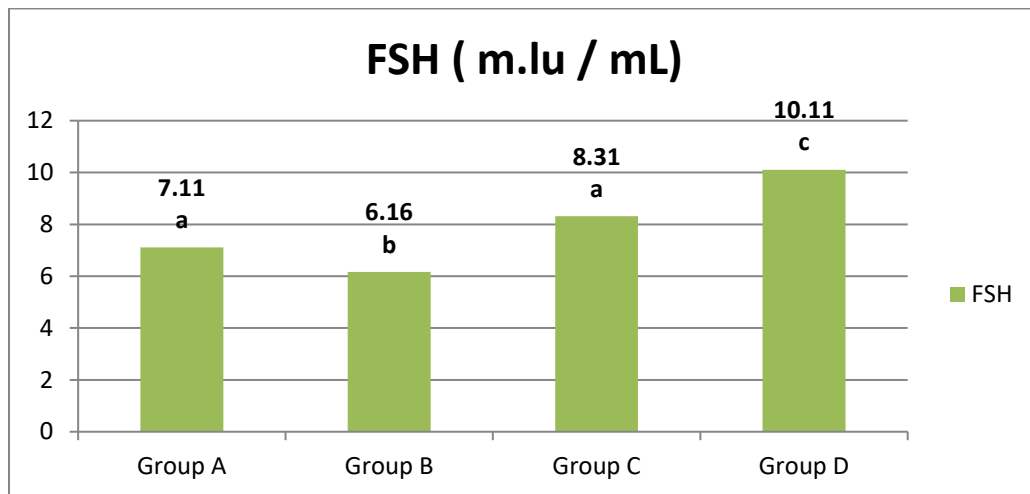


Figure 1. FSH concentration in control , infertile, hypothyroidism , and hypothyroidism and infertility women. Values represent mean $\pm$ SD. Different letters refer to significant differences among groups at level ($P < 0.05$). Similar letters refer to non-significant differences among groups.

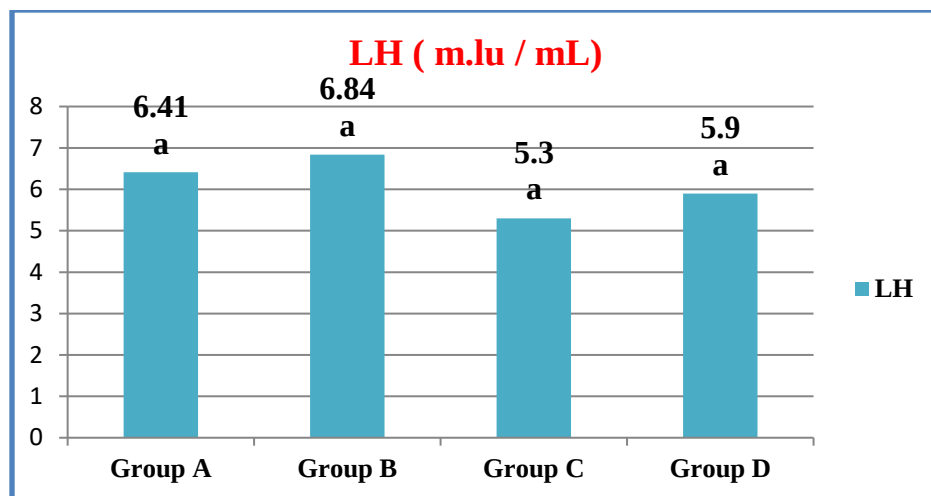


Figure 2. LH concentration in control , infertile, hypothyroidism , and hypothyroidism and infertility women . Values represent mean $\pm$ SD. Similar letters refer no significant differ between groups.

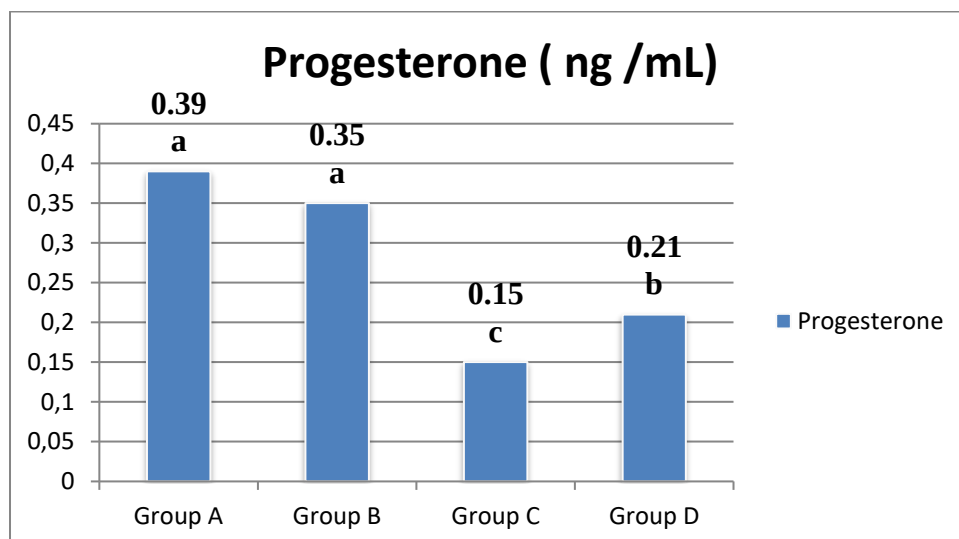


Figure 3. Progesterone concentration in control , infertile , hypothyroidism , and hypothyroidism and infertility women . Values represent mean $\pm$ SD. Different letters refer to significant differences among groups at level ($P < 0.05$). Similar letters refer to non-significant difference among groups.

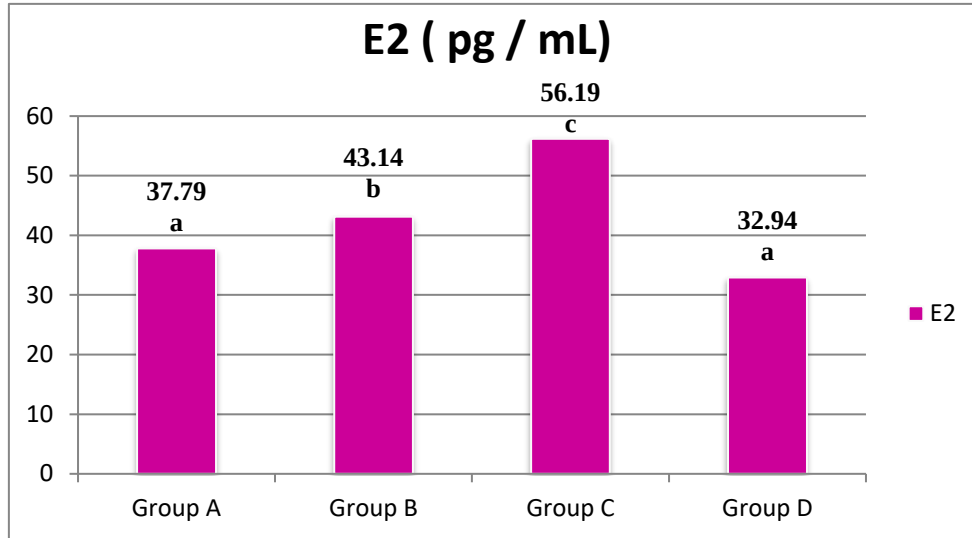


Figure 4. E2 concentration in control , infertile , hypothyroidism, and hypothyroidism and infertility women .Values represent mean $\pm$ SD. Different letters refer to significant differences among groups at level ($P < 0.05$) .Similar letters refer to non-significant differences among groups

Discussion

The results of this study about thyroid hormones agreement with study by [6] , which found T3 and T4 levels are significantly decreased and TSH levels were significantly increased in clinical hypothyroid females compared to controls. These Biochemical decreases in T4 and T3 lead to hyper-secretion of TSH from pituitary gland and amplified rises of its concentrations in serum [7]. TSH concentration highly significant increase in primary hypothyroidism group as compared to the control group [8] , another study carry out by [9] which found higher significant rise in TSH levels in the infertility women group compared to the control group. TSH level was found higher in infertile women than fertile [10] Generally, serum TSH measurement in infertile females is used for hypothyroidism detection [11] .

Hypothyroidism was diagnosed on the basis of history, physical examination findings and thyroid function tests showing high levels of TSH and low T3 and T4 [12]. Women with elevated TSH concentrations above 2.5 mIU / L had more menstrual disturbances and an ovulatory cycles, reduced oocyte fertilization and pregnancy rates, increased risk of in-vitro fertilization failure and greater recurrent miscarriage rates [13]. TSH was found to be rises in 4% and overt hypothyroidism was identified in 3.3%,ovulatory dysfunction was dominant compared to other cases of infertility according to study by [14].

The prevalence of hypothyroidism differ, in the infertile females, was revealed to range from 0.7% to 43%, this broad prevalence range was attribute to the variations in TSH measurement sensitivity [15], about 0.9% of infertile women had overt hypothyroidism but none had subclinical hypothyroidism according to study by [16]. The results of hormones in current study agree with the study done by [17] , which found decreased significantly in the levels of testosterone and progesterone in hypothyroidism females, and also agrees with the study that done by [18] ,that found hypothyroidism is associated with decreases levels of serum Testosterone. The study by [19] on men with hypothyroidism found positive relationship between highly TSH level and increased FSH level, negative relationship between T4 and FSH level, and the increase of FSH level lead to decrease testosterone , also increased LH level when TSH rise , T4 and testosterone decrease in men.

The results of the present study showed no differences significantly in the LH levels among groups, while E2 value increased significantly in the B and C groups and decrease in D group. FSH value showed increase significantly in D group ,progesterone values decrease significantly in (C and D groups)in comparison with control group.

The increasing of FSH level in this study may be tell us the ovarian reserve is poor ,while the decrease in the level of LH and FSH in hypothyroidism women was recorded in study [20] , they found significant decrease in serum LH in follicular, ovulatory and luteal phase in hyperprolactinemia women having primary and secondary infertility and Significantly low serum FSH value observed in ovulatory phase in women with primary infertility and in luteal phase in women with secondary infertility, and may be because these hormones measured in hypothyroidism and infertility women with hyperprolactinaemia.

THs interact with both estrogens and progesterone to maintain a normally functioning uterus and are necessary for the normal maturation of the oocytes, the impact of thyroid hormones has been reported to be both direct through the presence of thyroid hormone receptors on the ovaries and indirect through an impact on the secretion of sex hormone binding globulin SHBG, prolactin and luteinizing hormone releasing hormone (LH-RH) [21].

Conclusion

Hypothyroidism in women can affected on fertility by disorders in the levels of reproductive hormones and this may be lead to impaired in reproductive state in women.

We would like to thank the staff of Al-Sader Teaching Hospital and the Diabetes and Endocrine Center for helping us in collection of samples and for facilitating our work. Finally, we would like to express our gratitude to the Dr. Asaad Yahya Ayed for his assistance in statistical analysis.

References

- [1] J. Gilleron *et al.*, "A potential novel mechanism involving connexin 43 gap junction for control of Sertoli cell proliferation by thyroid hormones," *J. Cell. Physiol.*, vol. 209, no. 1, pp. 153–161, Oct. 2006.
- [2] F. Ahad and S. A. Ganie, "Iodine, iodine metabolism and iodine deficiency disorders revisited," *Indian J. Endocrinol. Metab.*, vol. 14, no. 1, pp. 13–17, Jan. 2010.
- [3] G. E. Krassas, F. Papadopoulou, K. Tziomalos, T. Zeginiadou, and N. Pontikides, "Hypothyroidism has an adverse effect on human spermatogenesis: A prospective, controlled study," *Thyroid*, vol. 18, no. 12, pp. 1255–1259, Dec. 2008.
- [4] N. Sridevi and M. Sandhya Rani, "Study of thyroid profile in infertile women," *IOSR J. Pharm. Biol. Sci.*, vol. 10, no. 3, pp. 57–61, 2015.
- [5] C. I. Erem *et al.*, "Plasma lipoprotein (a) concentrations in hypothyroid, euthyroid and hyperthyroid subjects," *Acta Cardiol.*, vol. 54, no. 2, pp. 77–81, Apr. 1999.
- [6] N. F. Elzobir, E. E. Hassan, S. M. Nassr, and E. M. AShrif, "Assessment of serum levels of prolactin in Sudanese female patients with primary hypothyroidism—Khartoum State, Sudan," *Asian J. Biomed. Pharm. Sci.*, vol. 4, no. 32, p. 28, May 2014.
- [7] R. M. Al-Salih, R. A. Hussein, and S. A. Ali, "A study of prolactin, thyroid stimulating hormones, malondialdehyde and ceruloplasmin levels in infertile women, in Thi-Qar Governorate/Iraq," *Thi-Qar Med. J.*, vol. 14, no. 2, pp. 14–21, 2017.
- [8] E. K. Aati and Z. A. Ridha, "Evaluation of prolactin, total testosterone and anti-Müllerian hormones in women with hypothyroidism at Misan City, Iraq," *Indian J. Public Health Res. Develop.*, vol. 10, no. 11, Nov. 2019.
- [9] T. F. Davies, C. A. Spencer, and L. M. Demers, "Laboratory medicine practice guidelines: Laboratory support for the diagnosis and monitoring of thyroid disease," *Thyroid*, vol. 13, no. 1, pp. 1–26, Jan. 2003.

- [10] P. Sibia, C. Kaur, J. Singh, B. Singh, and N. N. Ishrat, "Study of reproductive profile in hypothyroid females," *Int. J. Res. Med. Sci.*, vol. 4, pp. 37–42, 2018.
- [11] K. Poppe, B. Velkeniers, and D. Glinde, "The role of thyroid autoimmunity in fertility and pregnancy," *Nat. Clin. Pract. Endocrinol. Metab.*, vol. 4, no. 7, pp. 394–405, Jul. 2008.
- [12] N. Karaca and Y. K. Akpak, "Thyroid disorders and fertility," *Int. J. Res. Med. Sci.*, vol. 3, no. 6, pp. 1299–1304, Jun. 2015.
- [13] M. Arojoki, V. Jokimaa, A. Juuti, P. Koskinen, K. Irjala, and L. Anttila, "Hypothyroidism among infertile women in Finland," **Gynecol. Endocrinol.**, vol. 14, no. 2, pp. 127–131, Jan. 2000.
- [14] K. Poppe and B. Velkeniers, "Thyroid disorders in infertile women," *Ann. Endocrinol.*, vol. 64, no. 1, pp. 45–50, Feb. 2003.
- [15] G. E. Krassas, K. Poppe, and D. Glinde, "Thyroid function and human reproductive health," *Endocr. Rev.*, vol. 31, no. 5, pp. 702–755, Oct. 2010.
- [16] M. K. Cho, "Thyroid dysfunction and subfertility," *Clin. Exp. Reprod. Med.*, vol. 42, no. 4, p. 131, Dec. 2015.
- [17] N. C. Orazulike and E. P. Odum, "Evaluation of thyroid function in infertile female patients in Port Harcourt, Nigeria," *Trop. J. Obstet. Gynaecol.*, vol. 35, no. 1, pp. 38–43, Oct. 2018.
- [18] A. S. Al-khafaji and A. M. Jewad, "The prevalence of hypothyroidism in infertile women and its correlation with the pituitary gland hormones," *Int. J. Health Sci.*, vol. 6, no. S5, pp. 6520–6532, 2022.
- [19] S. Saran *et al.*, "Effect of hypothyroidism on female reproductive hormones," *Indian J. Endocrinol. Metab.*, vol. 20, no. 1, pp. 108–113, Jan. 2016.
- [20] A. S. Sultan, "Levels of testosterone hormone, LH and FSH in men affected with clinical hypothyroidism," *Middle East J. Sci. Res.*, vol. 27, no. 1, pp. 21–24, 2016.
- [21] A. Kalsum and S. Jalali, "Role of hyperprolactinemia in fertility," *Pak. J. Med. Res.*, vol. 41, no. 3, pp. 94–100, 2002.