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Relationship of Some Biomarkers and the Risk of Autoimmune Hypothyroidism (Hashimoto's) Among the Population in Thi-Qar Governorate

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Abstract

This study was designed to determine the prevalence of autoimmune hypothyroidism (Hashimoto's) and its impact on men and women in Thi-Qar Governorat. The current study included (100) people who were in two groups, with (50) people in each group. The first group includes patients with hypothyroidism (Hashimoto's), and the second group includes (Healthy) people who do not suffer from any thyroid disease. Blood samples were collected for the period from (January 1 to March 30/ 2023), for use in measuring the level of thyroid hormones and measuring the level of autoantibodies.

The results of the current study showed that female patients had the highest incidence of autoimmune hypothyroidism (Hashimoto's), at a rate of (68%), while for males, the incidence rate was (32%). As for the age group, the highest incidence rate was for ages over 40 years, and in both cases of the disease

The results also showed a relationship between (Sex, Family History, Smoking) and the risk of developing autoimmune hypothyroidism (Hashimoto's). The results of the current study also showed an increase in the average concentration of thyroid-stimulating hormone (TSH) in patients with hypothyroidism (Hashimoto's), corresponding to a decrease in the average concentration of each of the hormones (T3, T4, FT4) compared to the healthy group. An increase in the level of autoantibodies (Anti-TPOAb, Anti-TgAb) was also observed in patients compared to healthy people.

***Keywords*:** AITDs, Hashimoto's Disease, T3, T4, Anti-TPOAb, Anti-TgAb.

1. Introduction

Thyroid disorders are one of the most common disorders in many regions of the world, but prevalence rates vary between geographic regions, possibly due to environmental conditions, sex, age and iodine consumption [**1**]. One of the most important thyroid disorders is autoimmune disorders (AITD), which occur when the immune system attacks the thyroid gland with specific autoantibodies that cause a malfunction in the functioning of the thyroid gland. These antibodies are Anti-TgAb and Anti-TPOAb in hypothyroidism (Hashimoto) and Anti-TSHR in hyperthyroidism (Graves) [**2**].

There are a number of risk factors that contribute to the development of thyroid disease, such as iodine deficiency, Sex, Age, Smoking, Family History and others [**3**]. Iodine is an essential nutrient for the human body and an important substance for the synthesis of thyroid hormones as thyroid hormones maintain the basic activities of the body and have different effects on almost all body systems [**4**]**.** The most common cause of hypothyroidism in developing countries is iodine deficiency, which causes hypothyroidism with goiter. Iodine intake is one of the most common factors contributing to inflammation of the thyroid gland (Hashimoto). In areas with iodine deficiency, thyroid antibody levels have been found to be less prevalent compared to areas where iodine is well available **[5].**

Age and Sex are the most important risk factors for thyroid disorders, increasing the risk of thyroid disorders anywhere in the world in both men and women aged (50 years and over). The likelihood of thyroid disorders in women increases about (6-8) times more than in men, most age and gender-related thyroid disorders are hypothyroidism, which is more common in older women. It is 10 times more common in women than in men **[6]**. Hashimoto's goiter can occur at all ages, but is rare in children under 10 years of age and unusual in older adults [**7**].

Family history is an important risk factor for an increased risk of thyroid disease, as it is slightly greater if anyone has first-degree relatives (Father, Mother, Brother, Son) with a thyroid disease. In addition, a family history of any autoimmune disease significantly increases the risk of autoimmune thyroid diseases such as Hashimoto's disease or Graves' disease [**8**].

Smoking increases the risk of thyroid disease, as cigarettes contain thiocyanate, a chemical that negatively affects the thyroid gland and acts as an anti-thyroid agent. Some researchers have found that smoking may increase the risk, severity and side effects of hypothyroidism in Hashimoto's patients. Smoking also leads to ophthalmopathy (enlargement around the eyes or exophthalmosis) which is a

complication of Graves' disease, and smoking also reduces the effectiveness of treating thyroid diseases **[9].**

Hashimoto's Thyroiditis The most common immune thyroid disorder is Autoimmune Thyroid Disorders (AITDs), also known as lymphatic thyroiditis, which is the leading cause of hypothyroidism as about 20-30٪ of patients suffer from Hashimoto's disease. HT is thought to be caused by a combination of genetic and environmental factors that cause loss of immune tolerance, with the consequent autoimmune attack on thyroid tissue and the onset of disease **[10].** Hashimoto's thyroiditis (HT) is characterized by elevated levels of antithyroid autoantibodies in the blood Antithyroglobulin (Anti-TgAb), Antithyroid Peroxidase (Anti-TPOAb). This disease is a cellular immunity that leads to the destruction of thyroid cells **[11].**

2. Methods

1- Sample collection:

This study was conducted in the laboratories of the College of Education for Pure Sciences/Thi-Qar University in cooperation with Al-Haboubi Hospital/Diabetes and Endocrinology Center and private clinics in the city of Nasiriyah. The study included (50) people of both sexes suffering from hypothyroidism (Hashimoto's). And (50) healthy people. Their ages ranged from (20-70) years. The level of thyroid hormones (T3, T4, TSH, FT4) and the level of antibodies (Anti-TPOAb, TgAb) were examined in the serum.

Blood samples for patients and healthy subjects were obtained in the hospital with the help of trained nurses to collect venous blood sample (5 ml) from patients and healthy subjects. Blood samples (5ml) were placed in clean and dry plastic tubes containing Gel Tube and then allowed to clot at 37 degrees Celsius for (10-25) minutes, then placed in the centrifuge at (3000) cycles per minute for (20-15) minutes to obtain serum to check the level of hormones and antibodies.

Data were collected on the basis of the questionnaire including (Age, Sex, Smoking, Family History). Within the approval and official letter issued by the Thi-Qar Health Department. Determine the level of thyroid hormones (T3, T4, TSH, FT4) and the level of antibodies to (Anti-TPOAb, TgAb). Using the device (VIDAS) and according to the instructions of the attached leaflet.

2- Statistical Analysis

The results of the study were statistically analyzed using the statistical program (SPSS) at the probability level ($P \leq 0.001$). And using ANOVA, Chi-Square Tests

3. Results

1- Measurement of levels of thyroid hormones and antibodies in the patient group and the healthy group

The results of the current study showed that there were significant differences in the concentrations of (TSH, T3, T4, FT4, Anti-TPOAb, Anti-TgAb) in the patient group compared to the healthy group, as it was observed that there was an increase in the average concentration of the hormone TSH in patients with hypothyroidism (Hashimoto's), and a decrease in the concentration rate (T3, T4, FT4) compared to the healthy group. As shown in Table (1).

Table (1): Levels of thyroid hormones and autoantibodies in the patient group compared to the healthy group

Hematological Parameters	Hashimoto No. 50	Control No. 50	p.value
	Mean ± SD		
TSH	12.32 ± 4.60	1.93 ± 0.63	<0.001
T3	1.89 ± 0.07	3.82 ± 0.63	<0.001
T4	2.20 ± 0.71	6.49 ± 1.62	<0.001
FT4	4.74 ± 0.87	12.34 ± 2.20	<0.001
Anti-TgAb	15.44 ± 2.70	0.16 ± 0.03	<0.001
Anti-TPOAb	18.53 ± 2.80	1.42 ± 0.26	<0.001

2- Groups Studied by Sex:

The results of the current study showed that the highest incidence rate was among females with hypothyroidism (Hashimoto) (68%), followed by males (32%) compared to healthy people. As shown in Table (2).

Table (2): Ratios of Patient Group to Healthy Persons by Sex

Characteristic	Hashimoto		Control	
Sex	**No.**	**%**	**No.**	**%**
Male	16	32.00	24	48.00
Female	34	68.00	26	52.00
Total	50	100%	50	100%

3-The studied groups according to age:

The results of the study showed that the highest disease incidence rate for people with Hashimoto's disease was in the age group (61-70) years with a rate of 42%, followed by the age group (51-60) years with a rate of 26%, while the lowest disease incidence rate was in the age group (20-30) years with a rate of 8% compared to healthy people. Shown in Table (3).

Table (3): Ratios of the total number of patients compared to the healthy group according to age

Age Groups	Hashimoto		Control	
	No.	**%**	**No.**	**%**
20-30	4	8.00	4	8.00
31- 40	5	10.00	6	12.00
41-50	7	14.00	10	20.00
51-60	13	26.00	12	24.00
61-70	21	42.00	18	36.00
Total	50	100%	50	100%

4- Groups Studied by Family History:

The results of the current study showed that the majority of Hashimoto patients had a family history (72%) while the percentage of patients without a family history was (28%) compared to healthy people. As shown in Table (4).

Table (4): Ratios of the group of patients compared to the healthy group by Family History

Family History	There is		Nothing	
	No.	**%**	**No.**	**%**
Hashimoto	36	72%	14	28%
Control	0	0.00	50	100%
Total	36	72%	64	28%

5-Groups Studied by Smoking:

The current study showed that the majority of Hashimoto patients were smokers (72%), while the percentage of non-smoking patients (28%) compared to healthy people. As shown in Table (5).

Table (5): Ratios of Patients to Healthy Persons by Smoking

Smoking	Smoker		Non smoker	
	No.70	**%**	**No.30**	**%**
Hashimoto	36	72%	14	28%
Control	34	68%	16	32%

4. Discussion:

The results of the current study showed statistically significant differences in the incidence of the disease according to Sex. The highest infection rate was among females with hypothyroidism (Hashimoto's) at (68%), followed by the percentage of males with (32%), compared to healthy people. The results of the

current study agreed with **[12],** who found that women have the highest rate of infection with hypothyroidism, at a rate of (87.8%). The current study agreed with **[13].** who found that the highest rate The incidence of autoimmune disorders of the thyroid gland was among females.

Showed that thyroid disease affects more women than men. The incidence of Hashimoto's thyroiditis was (17.7%) **[14]**. Reported that hypothyroidism is more prevalent in women over 55 years of age **[15]**. Insufficiency occurs in older women at (15% and 10%) in elderly men, which is common in most of the population **[16].** The high incidence in women may be due to the physiological changes they experience during their lifetime. In addition, many women during pregnancy have a high level of thyroid antibodies, and (33-50%) of women can develop autoimmune disorders even after pregnancy **[17].**

The results of the current study according to the relationship of age to autoimmune disorders of the thyroid gland showed that the highest incidence of Hashimoto disease was in the age group (61-70) years and (42%) respectively, followed by the age group (51-60) years and (26%). The lowest incidence was in the age group (20-30) years at 8%. Age and gender are the most important risk factors for thyroid disorders, the risk of infection increases in both men and women under the age of (50) years and older anywhere in the world. Women have a higher risk of developing them than men about (1-6) times, and hypothyroidism is more common in the elderly **[18].** Noted that thyroid disease is related to age and sex, and goiter occurs with increasing age between (30-50) years in both sexes, but occurs more often in women than men **[19]**. The results of the current study agreed with the results of the researcher, who confirmed during her study that the age group over 30 years recorded the highest incidence in the case of hypothyroidism by (65%), while the lowest incidence rate was in the age group less than 30 years (34%)**[20]**. indicated that hypothyroidism is more prevalent in women (6-10%) compared to men (2-4%), especially in women older than 60 years and at a rate of up to 20%. Females are more likely to have positive antibodies and have a risk of hypothyroidism (Hashimoto) **[21]**. Thyroid antibodies are more common in females, due to the effect of progesterone and estrogen that can cause nervous tension during menstruation or pregnancy. Estrogen can activate the immune system to increase the production of antithyroid antibodies **[22].**

Having a family history of thyroid disorders is one of the most important risk factors that contribute to an increased chance of thyroid disease. Confirmed that (70-80%) of patients have a susceptibility to autoimmune thyroid disease on a genetic basis and (20-30%) autoimmune thyroid disease appears as a result of exposure to various environmental stimuli such as iodine intake, radiation, smoking and iodine intake **[23]**.

The current results show that there is an association between the risk of developing autoimmune disorders of the thyroid gland and the presence of a family history. The percentage of patients with a family history of hypothyroidism (Hashimoto) was (72%). This study agreed with the findings of during his study that most patients with hypothyroidism had a family history of injury (77.7%) **[24]**. Explained during his study that 33% of cases had a family history of thyroiditis (Hashimoto) patients, and 3.6% were found to suffer from hypothyroidism **[25]**. The results of the researcher showed that (43.75%) of the patients had a family history of thyroid disorders in one or more members of their family history, out of the total percentage, (26.25%) of hypothyroidism patients and (17.5%) of hyperthyroidism patients had a family history **[26]**.

The current study showed that the majority of Hashimoto's patients were smokers, with a percentage of (72%). The study of confirmed the existence of a relationship between the incidence of hyperthyroidism and smoking in females, as the highest incidence was among women who smoke**[27]**. Also found that the risk of developing hyperthyroidism in women who smoke increases by two times compared to women who do not smoke **[28]**. Also indicated that there is an association between smoking and the risk of developing hyperthyroidism (Graves) **[29]**. While indicated that there is no association between smoking and the risk of developing hyperthyroidism (Graves) **[30]**. While noted that smoking reduces the incidence of hypothyroidism (Hashimoto's) **[31]**.

5. Conclusion

The results of the current study revealed the following conclusions:

1- Higher rates of hypothyroidism (Hashimoto's) in women compared to men.
2- There is a relationship between high levels of autoantibodies (Anti-TPOAb, Anti-TgAb) and the risk of developing the disease.
3- The majority of cases of the disease occurred in people over 40 years of age.
4- There is a relationship between (Age, Sex, Smoking, and Family History) and the risk of developing hypothyroidism (Hashimoto's)**.**

References

[1]Legakis, I., Manousaki, M., Detsi, S., and Nikita, D. (2013). Thyroid function and prevalence of anti-thyroperoxidase (TPO) and anti-thyroglobulin (Tg) antibodies in outpatients hospital setting in an area with sufficient iodine intake: influences of age and sex. Acta Medica Iranica, pp: 25-34.

[2] Ramos-Leví, A. M., and Marazuela, M. (2016). Pathogenesis of thyroid autoimmune disease: the role of cellular mechanisms. Endocrinología y Nutrición, 63(8), pp: 421-429.

[3] Anaya, J. M., Rojas-Villarraga, A., and García-Carrasco, M. (2012). The autoimmune tautology: from polyautoimmunity and familial autoimmunity to the autoimmune genes. Autoimmune diseases, pp: 297193.

[4] Liu, P., Fan, L., Meng, F., Su, X., Liu, S., Shen, H., and Sun, D. (2020). Prevention and Control of Iodine Deficiency Disorders - China, 1995-2020. China CDC weekly, 2(20), pp: 345–349.

[5] Ferrari, S. M., Fallahi, P., Ruffilli, I., Elia, G., Ragusa, F., Benvenga, S., and Antonelli, A. (2019). The association of other autoimmune diseases in patients with Graves' disease (with or without ophthalmopathy): review of the literature and report of a large series. Autoimmunity reviews, 18(3), pp: 287-292.

[6] Fang, H., Zhao, R., Cui, S., and Wan, W. (2022). Sex differences in major cardiovascular outcomes and fractures in patients with subclinical thyroid dysfunction: a systematic review and meta-analysis. Aging (Albany NY), 14(20), pp: 8448.

[7] Abdullah, Y. J., Essa, R. H., and Jumaa, M. G. (2022). Incidence of Hashimoto's thyroiditis and its relationship to age, sex, smoking and blood groups. NTU Journal of Pure Sciences, 1(2), pp:1-9.

[8] Kocełak, P., Owczarek, A. J., Wikarek, A., Ogarek, N., Oboza, P., Sieja, M., Szyszka, A., Rozmus-Rogóż, I., Puzianowska-Kuźnicka, M., Olszanecka-Glinianowicz, M., and Chudek, J. (2022). Anti-thyroid antibodies in the relation to TSH levels and family history of thyroid diseases in young Caucasian women. Frontiers in endocrinology, 13, pp1081157.

[9] Kodirova, N. (2022). The Effect of Tobacco Smoking on the Thyroid gland. More information about children and children, 2(12), pp:214-216.

[10] Ragusa, F., Fallahi, P., Elia, G., Gonnella, D., Paparo, S. R., Giusti, C., and Antonelli, A. (2019). Hashimotos' thyroiditis: Epidemiology, pathogenesis, clinic and therapy. Best Practice & Research Clinical Endocrinology & Metabolism, 33(6), pp:101367.

[11] Ralli, M., Angeletti, D., Fiore, M., D'Aguanno, V., Lambiase, A., Artico, M., and Greco, A. (2020). Hashimoto's thyroiditis: An update on pathogenic mechanisms, diagnostic protocols, therapeutic strategies, and potential malignant transformation. Autoimmunity Reviews, 19(10), pp:102649.

[12] Chen, X. J., Gong, X. H., Yan, N., Meng, S., Qin, Q., Jiang, Y. F., and Zhang, J. A. (2015). RNASET2 tag SNP but not CCR6 polymorphisms is associated with autoimmune thyroid diseases in the Chinese Han population. BMC medical genetics, 16(1), pp:1-8.

[13] Cai, T., Wang, X., Muhali, F. S., Song, R., Shi, X., Jiang, W., and Zhang, J. (2014). Lack of association between polymorphisms in the UBASH3A gene and autoimmune thyroid disease: a case control study. Arquivos Brasileiros de Endocrinologia & Metabologia, 58, pp:640-645.

[14] Swiechowicz, B., Kasielska-Trojan, A., Manning, J. T., and Antoszewski, B. (2022). Can Digit Ratio (2D:4D) Be Indicative of Predispositions to Autoimmune Thyroid Diseases in Women - Hashimoto Thyroiditis and Graves' Disease?. Frontiers in endocrinology, 13, pp:914471.

[15] Wen, W., and Liu, F. (2007). Autoantibodies highly increased in patients with thyroid dysfunction. Cell. Molec. Immunol, 4(3), pp:233-236.

[16] MONDAL, S. I., DAS, S. A., AKTER, A., HASAN, R., TALUKDAR, S. A., and REZA, M. S. (2011). Thyroid hormone and its correlation with age, sex and serum lipid levels in hypothyroid and euthyroid sylheti populations in Bangladesh. Young, 25, pp:40.

[17] Peterson, G. (2011). Subclinical hypothyroidism in the elderly: a common dilemma. Australian Pharmacist, 30(7), pp:555-556.

[18] Stagnaro-Green, A., Abalovich, M., Alexander, E., Azizi, F., Mestman, J., Negro, R., and Wiersinga, W. (2011). American Thyroid Association Taskforce on Thyroid Disease During Pregnancy and Postpartum. Guidelines of the American Thyroid Association for the diagnosis and management of thyroid disease during pregnancy and postpartum. Thyroid, 21(10), pp:1081-1125.

[19] Ferrari, S. M., Fallahi, P., Ruffilli, I., Elia, G., Ragusa, F., Benvenga, S., and Antonelli, A. (2019). The association of other autoimmune diseases in patients with Graves' disease (with or without ophthalmopathy): review of the literature and report of a large series. Autoimmunity reviews, 18(3), pp:287-292.

[20] Al-Faisal, A. H. M., Al-Ramahi, I. J., Abudl-Hassan, I. A., Hamdan, A. T., and Barusrux, S. (2014). Detection of heterozygous c. 1708C> T and c. 1978C> G thyroid peroxidase (TPO) mutations in Iraqi patients with toxic and nontoxic goiter. Comparative Clinical Pathology, 23, pp:69-75.

[21] Kim, Y. A., and Park, Y. J. (2014). Prevalence and risk factors of subclinical thyroid disease. Endocrinology and metabolism, 29(1), pp:20-29.

[22] Al-Fatlawi, A. C. Y. (2022). An evaluation of blood glucose and lipid profile in female hypothyroidism patients in Kerbala province, Iraq. Biomedicine, 42(3), pp:556-560.

[23] Sana, S., Sajon, S. R., Rana, S., & Mostarin, Z. (2017). A short review on congenital hypothyroidism, environmental thyroiditis and current status of thyroid disease in Bangladesh. Pharma Innovation, 6(10), 328-335.

[24] Yan, N., Meng, S., Zhou, J., Xu, J., Muhali, F. S., Jiang, W., and Zhang, J. (2014). Association between STAT4 gene polymorphisms and autoimmune thyroid diseases in a Chinese population. International Journal of Molecular Sciences, 15(7), pp:12280-12293.

[25] Strieder, T. G., Prummel, M. F., Tijssen, J. G., Endert, E., and Wiersinga, W. M. (2003). Risk factors for and prevalence of thyroid disorders in a cross-sectional study among healthy female relatives of patients with autoimmune thyroid disease. Clinical endocrinology, 59(3), pp:396-401.

[26] Amanee, K. Z. (2023). Estimate The Relation of IL-6 and TNF-α in Thyroid Dysfunctions at Thi-Qar province. Master Degree. University of Thi-Qar. College of Science.

[27] Andersen, S. L., Olsen, J., Wu, C. S., and Laurberg, P. (2014). Smoking reduces the risk of hypothyroidism and increases the risk of hyperthyroidism: evidence from 450 842 mothers giving birth in D enmark. Clinical endocrinology, 80(2), pp:307-314.

[28] Åsvold, B. O., Bjøro, T., Nilsen, T. I., and Vatten, L. J. (2007). Tobacco smoking and thyroid function: a population-based study. Archives of internal medicine, 167(13), pp:1428-1432.

[29] Manji, N., Carr-Smith, J. D., Boelaert, K., Allahabadia, A., Armitage, M., Chatterjee, V. K., and Franklyn, J. A. (2006). Influences of age, gender, smoking, and family history on autoimmune thyroid disease phenotype. The Journal of Clinical Endocrinology & Metabolism, 91(12), pp:4873-4880.

[30] Fawzi, S. M., Abdul-hassan, I. A., and Mahdi, B. M. (2018). Correlation between thyroid hormones and anti-TSHR Ab in graves' disease. Iraqi journal of biotechnology, 17(1).

[31] Abdullah, Y. J., Essa, R. H., and Jumaa, M. G. (2022). Incidence of Hashimoto's thyroiditis and its relationship to age, sex, smoking and blood groups. NTU Journal of Pure Sciences, 1(2), pp:1-9.