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EFFECT SOME ENVIRONMENTAL FACTORS ON AUTOANTIBODIES LEVELS ON IRAQI PATIENTS WITH HASHIMOTO HYPOTHYROIDISM

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Abstract

Background: Hashimoto's thyroiditis (HT) is a common autoimmune thyroid disorder characterized by the gradual destruction of the thyroid gland. It is influenced by a complex interplay of genetic, environmental, and lifestyle factors. Among these, environmental triggers such as smoking, dietary patterns, psychosocial stress, and vitamin D3 deficiency are increasingly recognized for their potential to modulate thyroid autoimmunity. Iraq, with its unique environmental and dietary conditions, presents a valuable context to investigate these associations.

Objective: To evaluate the relationship between key environmental factors—specifically smoking, dietary habits (iodine and gluten intake), psychosocial stress, and vitamin D3 levels—and the profiles of thyroid autoantibodies in Iraqi patients diagnosed with HT.

Methodology: This cross-sectional study enrolled 96 Iraqi patients (38 males, 58 females) diagnosed with HT from December 2023 to December 2024 in Baghdad. Data on lifestyle and dietary habits were collected through structured interviews. Laboratory assessments included measurements of thyroid hormones (T3, T4, TSH) and autoantibodies (Anti-thyroglobulin [Anti-TG], Anti-thyroid peroxidase [Anti-TPO], and TSH receptor antibody [TRAb]) using ECLIA and CMIA analyzers. Statistical analyses included chi-square tests and logistic regression models to identify associations.

Results: Female patients demonstrated a higher prevalence of Anti-TPO positivity (75%) than males (55%). Smoking, more frequent among males, was significantly associated with lower TRAb levels. While all participants consumed iodine-rich diets, 85% also followed gluten-rich diets. Vitamin D3 deficiency was observed in over 40% of participants, though it was not significantly associated with autoantibody levels. Gluten intake showed a mild association with T4 levels. Psychosocial stress had no significant impact on thyroid biomarkers. Notably, Anti-TPO levels showed a positive correlation with patient age.

Conclusion: Environmental factors, particularly smoking and dietary habits, appear to influence thyroid autoimmunity in Iraqi HT patients. Public health interventions focusing on smoking cessation and dietary management may contribute to better disease control. Further prospective studies are needed to confirm these findings.

Keywords: Hashimoto's thyroiditis, Anti-TG, Anti-TPO, Vitamin D3, environmental factors, iodine, and Autoimmune diseases.

1 Inroduction

Hashimoto's thyroiditis (HT), also known as chronic lymphocytic thyroiditis, is the leading cause of hypothyroidism globally. It is characterized by autoimmune destruction of the thyroid gland, mediated by autoreactive T cells and the production of autoantibodies such as anti-thyroid peroxidase (A-TPO) and anti-thyroglobulin (A-TG). The disease disproportionately affects women and is often associated with other autoimmune disorders, underscoring its complex immunopathology [1].genetic predisposition plays a critical role in HT

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development; environmental factors are increasingly recognized as modulators of disease onset and progression. For instance, studies have shown that environmental pollutants, including heavy metals and industrial toxins, can trigger immune dysregulation. Chronic exposure to such pollutants, prevalent in conflict zones like Iraq, exacerbates oxidative stress and inflammation, leading to increased autoantibody production [2]. Micronutrient status is another pivotal environmental factor influencing thyroid autoimmunity. Selenium, a key component of selenoproteins, is essential for antioxidant defense and thyroid hormone metabolism [3]. Deficiency in selenium has been linked to heightened A-TPO and A-TG levels, aggravating autoimmune activity. Similarly, vitamin D, known for its immunomodulatory effects, has been found to inversely correlate with thyroid antibody levels, suggesting that deficiency could potentiate immune dysregulation in HT patients [4]. In Iraq, dietary insufficiencies, smoking, and stress related to socioeconomic instability further compound the burden of HT. Poor dietary intake of iodine, either excess or deficiency, disrupts thyroid homeostasis and enhances autoantibody production. Smoking, another modifiable risk factor, has been associated with altered immune responses, exacerbating the risk of thyroid autoimmunity [5]. Understanding the interplay of these environmental factors is crucial, particularly in regions with unique exposures, such as Iraq. This study explores the influence of environmental and lifestyle factors on the levels of thyroid autoantibodies in Iraqi patients with Hashimoto's hypothyroidism, aiming to identify modifiable risk factors and inform targeted therapeutic strategies.[6]

The objectives of present study are Assess the association of thyroid-related autoantibody levels with various environmental influences, such as smoking, Vitamin D3, Iodine diet, gluten diet, and psychosocial stress in patients with Hashimoto hypothyroidism.

2 Methodology

2.1. study design

This research is cross-sectional observational study design to study the impact of environmental factors (vitamin D3 level, smoking, iodin diet, gluten containing diet, and psychosocial stress) on patients with Hashimoto hypothyroidism. Sample size of this study (98 patients with Hashimoto hypothyroidism). Inclusion Criteria include Confirmed diagnosis of Hashimoto's thyroiditis (based on clinical evaluation, elevated thyroid autoantibodies, and ultrasound findings), Iraqi patients aged 18 years and above, and Willingness to provide informed consent. Exclusion Criteria include: Pregnant or lactating women, and Patients with coexisting severe systemic illnesses or other thyroid disorders.

2.2. Sample collection

96 samples (38 male and 58 female) were collected from Privet laboratory in specialist laboratory, Baghdad, Iraq during December 2023 to December 2024. Patients age ranged (24-63) years. The collection of samples based on clinical examination and laboratory findings. All patients were diagnosed under the

supervision of the endocrinology specialist doctor. For each patient the information was been taken by information form include: (Gender, age, symptoms, duration of disease, other autoimmune disease, iodin containing diet, Gluten containing diet, smoking/ non-smoking, psychosocial stress/ no-psychosocial stress and medication intake).

2.3. T3, T4, and TSH Measurement

T3, T4, and TSH have been measured by Cobas e411 analyzer (Roche Diagnostics/Germany) is an automated system based on electrochemiluminescence immunoassay (ECLIA) technology, widely used for the precise and reliable quantification of thyroid hormones: T3 (triiodothyronine), T4 (thyroxine), and TSH (thyroid-stimulating hormone).

2.4. Anti-TG, Anti-TPO, and Anti-TSH-Receptor measurement

Anti-TG, Anti-TPO, and Anti-TSH-Receptor by (Abbott Architect i1000SR/USA) is a chemiluminescent microparticle immunoassay (CMIA) system, commonly used for precise detection of thyroid autoantibodies: Anti-thyroglobulin (Anti-TG), Anti-thyroid peroxidase (Anti-TPO), and Anti-TSH receptor (Anti-TSHR).

2.5. Statistical analysis

Statistical analysis in this study was performed using Microsoft Excel for initial data organization and descriptive statistics, and SPSS software for advanced statistical analyses, including correlation and regression models. Descriptive statistics were used to summarize the baseline characteristics of the study population, presenting continuous variables as mean ± standard deviation (SD) and categorical variables as percentages to provide a clear overview of the data distribution. Inferential analysis included correlation analyses to explore the relationships between thyroid autoantibody levels and factors such as smoking, Vitamin D levels, iodine intake, and psychosocial stress. Additionally, multivariate regression models were employed to adjust for confounding variables and identify independent predictors contributing to elevated thyroid autoantibody levels.

3 Results

3.1. General description

The table highlights differences and similarities in non-biological factors between females and males. For disease duration, newly diagnosed cases are slightly more common among males (25%) than females (18.3%), but the variation over the years is inconsistent and statistically insignificant. Smoking habits, however, show a striking gender gap 75% of males are smokers compared to only (17%) of females. Conversely, the majority of females (83%) are non-smokers, unlike 25% of males.(Table 1).

3.2. Comparison between sex and non-biological Factors

Regarding dietary habits, all participants reported an iodine-rich diet, with no iodine-poor diets recorded. Gluten consumption habits are identical between genders, with most individuals consuming a gluten-rich diet (85%) and a smaller

proportion following a gluten-free diet (15%). Stress levels were also comparable, with no meaningful difference between the genders (42%) of females and 38% of males reported experiencing stress. As demonstrated in Table 2.

3.3. Comparison of Biochemical Markers and Vitamin D3 Levels Between sexes

The table compares biochemical markers between females and males. For T3 levels, there are no major differences between genders in the proportions of individuals with low or normal levels, and their mean values are statistically similar. In contrast, males are more likely to have low T4 levels (45% vs. 20%), a significant difference, although the average T4 levels between genders are not different.

Females exhibit a higher prevalence of high TSH levels (97% vs. 80%), with the average TSH levels trending higher in females but not quite reaching statistical significance. Anti-Tg levels, although slightly higher in females, show no significant gender differences. However, high ATPO levels are significantly more common in females (75%) than males (55%).

For TRAb levels, no meaningful differences are observed between genders. Regarding vitamin D3, while males slightly outnumber females in sufficient levels, the average vitamin D3 levels are significantly higher in males. As demonstrated in Table 3.

3.4. Comparison of Age Across Demographic, and Environmental Factors

The table compares the average ages of individuals across various demographic and lifestyle factors. Age does not differ significantly between genders, with females averaging 41.4 years and males 40.7 years. However, disease duration reveals significant differences in age, as newly diagnosed individuals tend to be younger (36.4 years) compared to those with longer disease durations, with ages peaking at 63 years for those with six years of disease duration.

Smoking status shows no impact on age, with smokers and non-smokers having nearly identical averages. While data on iodine-poor diets are unavailable, individuals consuming a gluten-rich diet are significantly older (42.6 years) than those on a gluten-free diet (33.7 years). Additionally, individuals experiencing psychosocial stress tend to be slightly younger (40.4 years) than those who are not stressed (41.7 years), with a small but statistically significant difference. As shown in Table 4.

3.5. Comparison biochemical markers, vitamin D3 levels, and average age

The table analyzes the connection between various biochemical markers, vitamin D3 levels, and average age. For most markers, no significant differences in age were observed. For example, T3, T4, TSH, anti-Tg, and TRAb levels showed no meaningful association with age. However, a notable exception was found in anti-TPO levels: individuals with high anti-TPO levels were significantly older (44.5 years) compared to those with normal levels (34.3 years). In terms of vitamin D3, while no statistical significance was observed, there was a trend where

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individuals with insufficient levels were slightly older (43.4 years), and those with deficient levels were younger (38.7 years), compared to those with sufficient levels (41.4 years). (Table 4).

3.6. Comparison non-biological parameters with thyroid hormones

This table below investigates how T3, T4, and TSH levels are influenced by disease duration, smoking habits, gluten diet, psychosocial stress, and vitamin D3 levels. Disease duration significantly impacts T3, T4, and TSH levels. Newly diagnosed individuals mostly exhibit normal T3 and T4 levels but have universally high TSH levels. Over time, the prevalence of low T3 and low T4 increases, with all individuals showing low T3, low T4, and high TSH by the 6th year of disease duration. Smoking habits do not significantly affect T3, T4, or TSH levels, with similar distributions observed among smokers and non-smokers. Gluten consumption shows an interesting trend, where individuals on a gluten-free diet are more likely to have low T4 levels compared to those on a gluten-rich diet. However, T3 and TSH levels are not significantly influenced by gluten intake. Psychosocial stress does not show a meaningful association with any of the markers. Similarly, vitamin D3 levels whether sufficient, insufficient, or deficient do not significantly affect T3, T4, or TSH levels.

As illustrated in table 6.

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3.7. Comparison non-biological parameters with Autoantibodies levels

The table 7 evaluates the relationships between Anti-Tg, Anti-TPO, and TRAb levels with disease duration, smoking status, gluten diet, psychosocial stress, and vitamin D3 levels. Disease Duration shown Significant changes in ATg and ATPO levels are observed over time, with a higher prevalence of elevated levels as the disease progresses. Elevated ATPO levels are particularly prominent in advanced stages. TRAb levels, however, do not show significant variation with disease duration. In Smoking Habit, the results appear the Non-smokers exhibit a higher prevalence of elevated ATg and ATPO levels compared to smokers. Smokers are more likely to have low TRAb levels, indicating a significant association. In A gluten-rich diet is associated with elevated ATPO levels but does not significantly affect ATg or TRAb levels. Gluten-free diets have a slight tendency toward low TRAb levels. Psychosocial stress does not show significant associations with ATg, ATPO, or TRAb levels, though stressed individuals tend to have slightly higher proportions of elevated ATg levels and low TRAb levels. Also, no significant associations are found between vitamin D3 status and ATg, ATPO, or TRAb levels, suggesting vitamin D3 does not play a major role in these markers.

3.8. Statistical correlations

This (figure-1) shows a statistically significant, weak positive relationship between age and ATPO levels in patients with hypothyroidism. As age increases, there is a slight upward trend in ATPO levels, as indicated by the correlation coefficient ***(R=+ 0.342)*** and the regression line equation (***y=10.6x−275.2y***). The significance level (P=0.028) confirms this relationship is unlikely due to random chance.

Also, there are correlation between thyroid hormones and Anti-Tg. The (figure-2) explores the relationship between ATg levels and thyroid hormones (T3, T4, and TSH). As ATg levels rise, TSH shows a positive correlation with a clear upward trend, while T3 and T4 levels remain relatively unaffected, displaying minimal change.

4 Discussion

This study examined the impact of various environmental factors on thyroid autoantibody levels in Iraqi patients with Hashimoto hypothyroidism (HT). The findings revealed significant associations between environmental influences such as smoking, dietary habits, and vitamin D3 levels with thyroid autoimmunity markers, namely anti-thyroglobulin (Anti-TG), anti-thyroid peroxidase (Anti-TPO), and TSH receptor antibodies (TRAb).

4.1. Autoantibody Levels and Environmental Factors

Among the patients studied, elevated Anti-TPO levels were notably higher in females (75%) compared to males (55%). This aligns with findings in global studies, which highlight the higher prevalence of autoimmune thyroid diseases in women due to hormonal and immunological differences [1]. Smoking showed a paradoxical pattern: while smokers were less likely to have elevated Anti-TPO levels, they exhibited lower TRAb levels compared to non-smokers. These results corroborate with Hu & Rayman (2017) [5], who reported that smoking modifies immune responses, potentially attenuating certain autoantibodies in HT.

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Dietary habits were also critical. All participants reported iodine-rich diets, with no iodine deficiency observed. Interestingly, patients following a gluten-free diet exhibited a higher tendency for low T4 levels compared to those on gluten-rich diets, suggesting a potential interplay between dietary gluten and thyroid function. This is consistent with Hu & Rayman (2017) [5], who emphasized that dietary factors like iodine and gluten have profound effects on thyroid autoimmunity.

4.2. Vitamin D3 Deficiency

Vitamin D3 levels emerged as another pivotal factor. While males had significantly higher average vitamin D3 levels compared to females, the prevalence of vitamin D insufficiency and deficiency remained high (41% overall). Previous research has established a robust inverse correlation between vitamin D3 levels and autoimmune markers like Anti-TPO [7]. Our findings, however, suggest that while vitamin D3 deficiency correlates with heightened autoantibody production, it did not independently predict elevated thyroid autoantibody levels. This divergence might stem from regional dietary and environmental variations specific to Iraq, as hypothesized by Street et al. (2024) [6].

4.3. Comparison with Previous Studies

Globally, the role of environmental and dietary factors in HT has been extensively studied. [8] highlighted genetic predisposition as a cornerstone of HT development but underscored the significant role of environmental triggers. Our study further supports this by demonstrating the compounded impact of regional stressors, such as socioeconomic instability and pollution, on thyroid autoimmunity in Iraq. Additionally, while Riyam et al. (2022) [9] emphasized selenium deficiency as a critical factor in thyroid dysfunction, its role was not evaluated in this study, leaving a gap for future exploration.

The correlation between age and thyroid markers also mirrors prior findings. Older patients showed significantly higher Anti-TPO levels, consistent with Zeber-Lubecka N et al. (2022) and Bogusławska J et al. (2021) [10][11], who attributed this to cumulative exposure to environmental pollutants and immune aging.

5 Conclusion

This study sheds light on the intricate relationship between environmental factors and thyroid autoimmunity in Iraqi patients with Hashimoto hypothyroidism. The findings confirm that factors such as smoking, dietary habits, psychosocial stress, and vitamin D3 levels significantly influence the progression and severity of the disease. Notably, the striking differences in autoantibody levels between genders emphasize the need for gender-specific approaches in disease management. Furthermore, the study highlights

Ethical issues

The research and protocol for this study was received approval from the Ethics Committee of Al-Nahrain University, Higher Institute of Forensic Sciences.

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ТАБЛИЦЫ

Table 1. General descriptive of the study

<table>
<tr><td colspan="14">1. Gender, Age & Disease duration</td></tr>
<tr><td colspan="2">Gender</td><td rowspan="2">Overall Age (years)</td><td colspan="11">Disease duration (Years)</td></tr>
<tr><td>Male</td><td>Female</td><td colspan="2">Newly diagnosed</td><td colspan="2">1</td><td colspan="2">2</td><td colspan="2">3</td><td colspan="2">4</td><td>5</td><td>6</td></tr>
<tr><td>40%</td><td>60%</td><td>41.2±8.8</td><td colspan="2">21%</td><td colspan="2">15%</td><td colspan="2">16%</td><td colspan="2">17%</td><td colspan="2">29%</td><td>1%</td><td>1%</td></tr>
<tr><td colspan="14">Overall non-biological parameters</td></tr>
<tr><td colspan="3">Smoking</td><td colspan="3">Iodine diet</td><td colspan="3">Gluten diet</td><td colspan="5">Psychosocial stress</td></tr>
<tr><td colspan="2">Smoker</td><td colspan="2">Non-smoker</td><td colspan="2">Iodine-rich</td><td colspan="2">Iodine-poor</td><td colspan="2">Gluten-rich</td><td colspan="2">Gluten-free</td><td colspan="2">Present</td><td colspan="2">Absent</td></tr>
<tr><td colspan="2">40%</td><td colspan="2">60%</td><td colspan="2">100%</td><td colspan="2">0%</td><td colspan="2">85%</td><td colspan="2">15%</td><td colspan="2">40%</td><td colspan="2">60%</td></tr>
<tr><td colspan="14">Overall biological markers/factors</td></tr>
<tr><td colspan="2">T3 level</td><td colspan="2">T4 level</td><td colspan="2">TSH level</td><td colspan="2">Anti-TG</td><td colspan="2">Anti-TPO</td><td colspan="2">TRAb</td><td colspan="3">D3</td></tr>
<tr><td>L</td><td>N</td><td>L</td><td>N</td><td>H</td><td>N</td><td>H</td><td>N</td><td>H</td><td>N</td><td>N</td><td>H</td><td>Sufficient</td><td>Insufficient</td><td>Deficient</td></tr>
<tr><td>48%</td><td>52%</td><td>30%</td><td>70%</td><td>90%</td><td>10%</td><td>46%</td><td>54%</td><td>67%</td><td>33%</td><td>72%</td><td>28%</td><td>61%</td><td>17%</td><td>28%</td></tr>
<tr><td colspan="14">L=Low; H=High; N=Normal</td></tr>
</table>

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Table 2. Comparison of Non-Biological Factors Between Females and Males in Disease Characteristics and Lifestyle Habits

non-biological Factors		**Female**	**Male**	**P-value Chi square**
Disease duration (Year)	Newly diagnosed	18.3%	25%	0.250
	1	12%	20%	
	2	22%	8%	
	3	18%	15%	
	4	30%	28%	
	5	0%	3%	
	6	0%	3%	
Smoking habit	Smoker	17%	75%	**0.000***
	Non-smoker	83%	25%	
Iodine diet	Iodine-rich diet	100%	100%	**NA**
	Iodine-poor diet	0%	0%	
Gluten diet	Gluten-rich diet	85%	85%	1.00
	Gluten-free diet	15%	15%	
Psychosocial stress	Stressed	42%	38%	0.677
	Non-stressed	58%	63%	
*; highly significant, NA; non-Applicable				

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Table 3. Comparison of Biochemical Markers and Vitamin D3 Levels Between Females and Males.

		Female%	Male%	P-value Chi square	Female value	Male value	P-value t-test
T3 level	Low	48%	47%	0.935	0.65±0.11	0.63±0.19	0.577
	Normal	52%	53%		0.94±.0.08	0.99±0.08	
T4 level	Low	20%	45%	**0.008**	3.73±.0.59	3.78±0.5	0.778
	Normal	80%	55%		6.36±1.6	7.3±1.5	
TSH level	High	97%	80%	**0.006**	9.2±5.6	7.7±4.7	0.057
	Normal	3%	20%		4.1±0	4.1±0	
Anti-Tg level	High	52%	38%	0.164	300.2±341.9	232.2±304.6	0.319
	Normal	48%	62%		3±0.83	2.1±0.66	
ATPO level	High	75%	55%	**0.037**	262.2±326.4	189±249.4	0.096
	Normal	25%	45%		0.87±0.35	0.81±0.16	
TRAb level	Normal	68%	78%	0.317	0.91±0.53	0.69±0.28	0.057
	High	32%	23%		2.2±1.1	2.01±0.45	
Vit. D3 level	Sufficient	58%	65%	0.797	34.2±3.7	39.9±7.3	**0.016**
	Insufficient	18%	15%		24.8±3.9	24.6±4.7	
	Deficient	23%	20%		13.7±2.6	16.1±1.9	

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Table 4. Comparison of Average Age Across Demographic, Disease, and Lifestyle Factors

		Age (Years)	P-value (t-test)
Gender	Female	41.4±8.6	0.695
	Male	40.7±9.2	
Disease duration (Years)	Newly diagnosed	36.4±5.4	**0.000***
	1	41.7±6.2	
	2	48.1±8.3	
	3	44.1±6.8	
	4	37.8±9.5	
	5	41±0	
	6	63±0	
Smoking	Smoker	41.5±9	0.782
	Non-smoker	40.9±8.7	
Iodine diet	Iodine-rich	NA	
	Iodine-poor		
Gluten diet	Gluten-rich	42.6±8.3	**0.000***
	Gluten-free	33.7±7.7	
Psychosocial stress	Present	40.4±9.1	0.0475
	Absent	41.7±8.6	
*; highly significant, NA; non-Applicable			

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Table 5. Relationship Between Biochemical Markers, Vitamin D3 Levels, and Average Age.

		Age (Years)	P-value (t-test)
T3 level	**Low**	**41.9±9.5**	**0.393**
	Normal	**40.4±8.1**	
T4 level	**Low**	**39.5±7.1**	**0.231**
	Normal	**41.8±9.4**	
TSH level	**High**	**41.3±9.1**	**0.638**
	Normal	**39.9±4.9**	
Anti-Tg level	**High**	**39.8±8.5**	**0.166**
	Normal	**42.3±8.9**	
Anti-TPO level	**High**	**44.5±7**	**0.000**
	Normal	**34.3±8.1**	
TRAb level	**Low**	**41.5±9.5**	**0.543**
	Normal	**40.3±6.6**	
Vit. D3 level	**Sufficient**	**41.4±8.5**	**0.242**
	Insufficient	**43.4±9.9**	
	Deficient	**38.7±8.5**	

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Table 6. Relationship Between T3, T4, and TSH Levels and Disease Duration, Environmental factors, and Vitamin D3 Status.

		T3 level			T4 level			TSH level		
		Low	**Normal**	**Chi P-value**	**Low**	**Normal**	**Chi P-value**	**High**	**Normal**	**Chi P-value**
Disease duration (Years)	Newly diagnosed	47.6 %	52.4%	**0.027**	52.4 %	47.6%	**0.019**	100%	0%	**0.000**
	1	6.7%	93.3%		6.7%	93.3%		40%	60%	
	2	56.3 %	43.8%		6.3%	93.8%		100%	0%	
	3	58.8 %	41.2%		35.3 %	64.7%		94.1 %	5.9%	
	4	55.2 %	44.8%		37.9 %	62.1%		100%	0%	
	5	100%	0%		0%	100%		100%	0%	
	6	100%	0%		0%	100%		100%	0%	
Smoking habit	Non-smoker	51.7 %	48.3%	0.369	23.3 %	76.7%	0.075	90%	10%	1.00
	Smoker	42.5 %	57.5%		40%	60%		90%	10%	
Gluten diet	Gluten-free	53.3 %	46.7%	0.654	53.3 %	46.7%	**0.032**	100%	0%	0.161
	Gluten-rich	47.1 %	52.9%		25.9 %	74.1%		88.2 %	11.8%	
Psychosocial stress	Absent	50.0 %	50.0%	0.624	28.3 %	71.7%	0.656	91.7 %	8.3%	0.496
	Present	45%	55%		32.5 %	67.5%		87.5 %	12.5%	

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Vit. D3 level	Sufficient	28%	33%	0.857	15%	46%	0.319	55%	6%	0.960
	Insufficient	9%	8%		7%	10%		15%	2%	
	Deficient	11%	11%		8%	14%		20%	2%	

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Table 7. Associations Between Anti-Tg, Anti-TPO, and TRAb Levels and Environmental Factors.

		Anti-Tg level			Anti-TPO level			TRAb level		
		High	Normal	Chi P-value	High	Normal	Chi P-value	Low	Normal	Chi P-value
Disease duration (months)	Newly diagnosed	29%	71%	**0.008**	38.1%	61.9%	**0.005**	61.9%	38.1%	0.340
	1	60%	40%		93.3%	6.7%		53.3%	46.7%	
	2	25%	75%		81.3%	18.8%		81.3%	18.8%	
	3	35%	65%		82.4%	17.6%		70.6%	29.4%	
	4	72%	28%		55.2%	44.8%		82.8%	17.2%	
	5	0%	100%		100.0%	0.0%		100%	0%	
	6	0%	100%		100%	0%		100%	0%	
Smoking habit	Non-smoker	56.7%	43.3%	**0.009**	71.7%	28.3%	0.224	61.7%	38.3%	0.005
	Smoker	30%	70%		60%	40%		87.5%	12.5%	
Gluten diet	Gluten-free	33.3%	66.7%	0.286	33.3%	66.7%	**0.003**	86.7%	13.3%	0.170
	Gluten-rich	48.2%	51.8%		72.9%	27.1%		69.4%	30.6%	
Psychosocial stress	Absent	38.3%	61.7%	0.060	71.7%	28.3%	0.224	66.7%	33.3%	0.146
	Present	57.5%	42.5%		60%	40%		80%	20%	
Vit. D3 level	Sufficient	26%	35%	0.687	40%	21%	0.651	42%	19%	0.262
	Insufficient	9%	8%		13%	4%		15%	2%	
	Deficient	11%	11%		14%	8%		15%	7%	

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РИСУНКИ

Figure 1. Linear Correlation Between Age and ATPO Levels in Hypothyroidism Patients

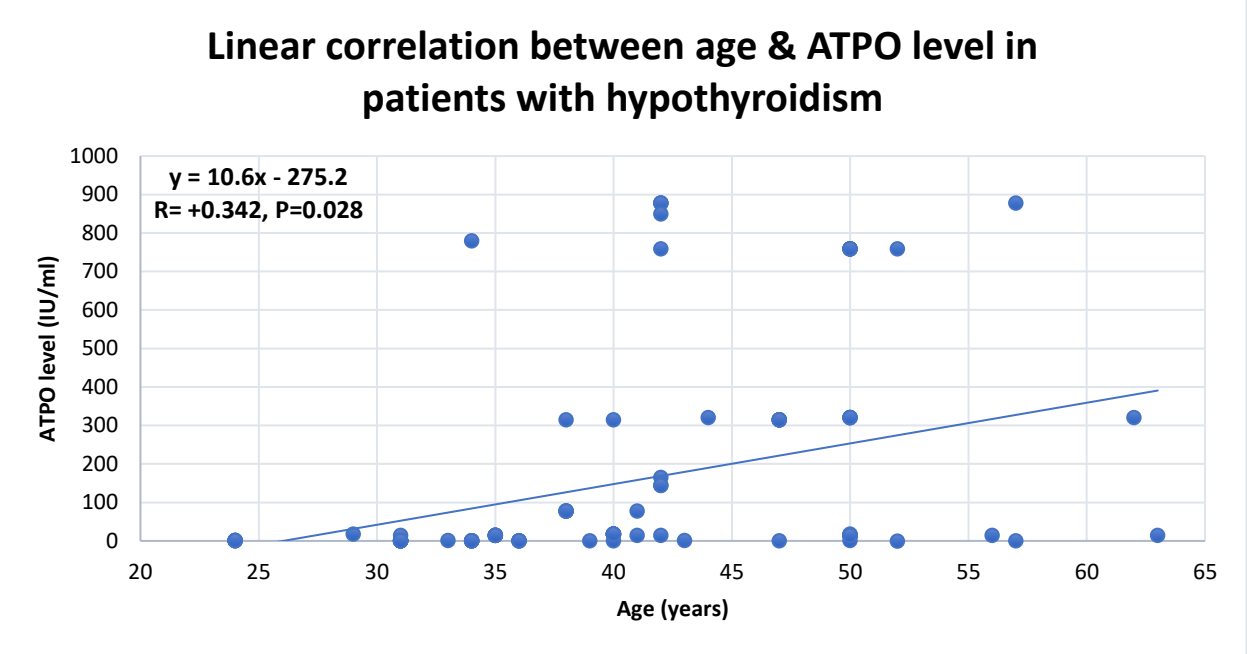
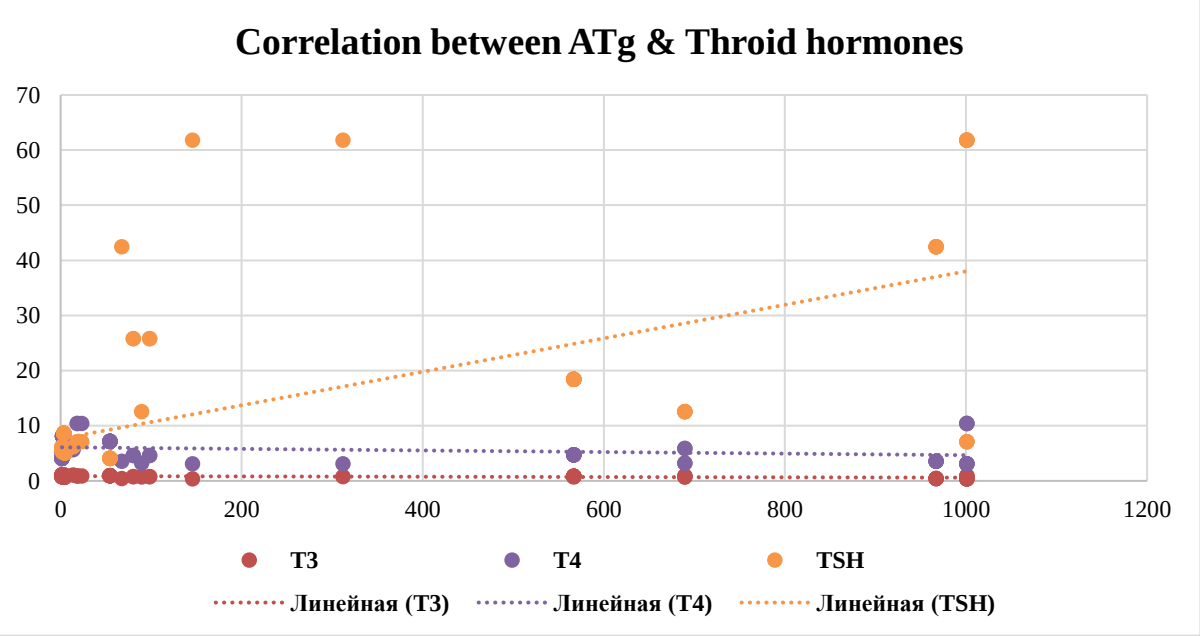


Figure 2. Correlation Between Anti-Tg Levels and Thyroid hormones.



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ТИТУЛЬНЫЙ ЛИСТ_МЕТАДАННЫЕ

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Блок 3. Метаданные статьи

EFFECT SOME ENVIRONMENTAL FACTORS ON AUTOANTIBODIES LEVELS ON IRAQI PATIENTS WITH HASHIMOTO HYPOTHYROIDISM

Сокращенное название статьи для верхнего колонтитула:

ENVIRONMENTAL FACTORS AND AUTOIMMUNITY IN IRAQI HASHIMOTO'S PATIENTS

Keywords: Hashimoto's thyroiditis, Anti-TG, Anti-TPO, Vitamin D3, environmental factors, iodine, and Autoimmune diseases.

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