Comparison between CRP Level and Some Biochemical Parameters in Hashimoto and Hypothyroidism Iraqi Patients

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المقارنة بين بروتين سي التفاعلي و الفحوصات الكيمياوية الحيوية لمرضى الهاشيموتو ومرضى خمول الغدة الدرقية في المرضى العراقيين

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Abstract

Background: Hypothyroidism is a common medical condition that occurs due to a lack of the hormone thyroxine. Hashimoto's thyroiditis (HT) is the most prevalent thyroid disorder, also known as autoimmune thyroid disease (AITD). Approximately 20-30% of people develop hypothyroidism due to ongoing inflammation of the thyroid tissue it triggers. **Aims**: To investigate the difference between inflammatory and biochemical test in Hashimoto autoimmune thyroiditis (AITD) and hypothyroidism patients (non-autoimmune) **Methods**: The study was done on 50 Hashimotos patients, 50 Hypothyroidism patients from the Endocrinology Unit at Baghdad Teaching Hospital and Educational Laboratories / Baghdad City, Iraq, and 50 control healthy subjects during the first half of the year 2024, from 7th January until 25th August 2024. **Results**: The mean BMI of the HT group was (33.07±4.6) and for hypothyroidism group was (31.92±3.0), did not show statistically significant differences (p=0.293). However, the mean BMI of both groups differed highly statistically significant (p≤0.001) when compared to that of the control group (21.72±1.43). Median serum levels of cholesterol in HT was (54.7) while in hypothyroidism was (47.9) while for the control group was (15.1), the p-value for the three groups was (≤0.001) and showed highly significant differences. Calcium median results were (0.86) for HT, (0.91) for hypothyroidism patients while (0.95) for control group all were highly significant statically (≤0.001). Finally, CRP showed highly statistically significant difference (p≤0.001) when the levels of these parameters were compared among Hashimoto group, hypothyroidism group, and control group with median range in HT (11.2), hypothyroidism (6.2) and control group (1.91). **Conclusions**: BMI had no significant differences between HT and hypothyroidism group but the two groups were different significantly from the control group, CRPL3, CA, Cholesterol all were different significantly between HT, Hypothyroidism and control group.

Keywords: HT, Thyroxine, AITD, Indirect immunofluorescence, CRP, Ca

Abbreviations

HT: Hashimoto's thyroiditis

AITD: Autoimmune thyroid disease

TSH: Thyroid stimulating hormone

Ca: calcium

CRP: C-reactive protein

BMI: Body mass index

المستخلص

المقدمة: خمول الغدة الدرقية واحد من الامراض الشائعة الناتجة عن نقص هرمون الثيروكسين. الهاشيموتو واحد من أكثر الامراض شيوعا للغدة الدرقية يسمى ايضا بمرض الغدة الدرقية المناعي، ما يقارب 20 – 30 % من مرضى الهاشيموتو يعانون من قصور الغدة الدرقية بسبب تكرار الالتهاب في نسيج الغدة الدرقية. **الهدف:** دراسة الفرق بين مؤشر الالتهاب وبعض الفحوصات البيوكيماوية لمرضى الهاشيموتو (مرض الغدة الدرقية المناعي) ومرضى قصور الغدة الدرقية (غير المناعي) **طريقة العمل:** اجريت الدراسة على (50) مريض مصاب بالهاشيموتو و (50) مريض مصاب بقصور الغدة الدرقية غير المناعي المراجعين الى العيادة الاستشارية لأمراض الغدد الصماء في مستشفى بغداد وحدة المختبرات الاستشارية و50 شخص سليم في النصف الاول من عام ٢٠٢٤ أي للفتره من يوم ٧ كانون الثاني الى يوم ٢٥ اغسطس. **النتائج:** كان متوسط مؤشر كتلة الجسم لمرضى الهاشيموتو (4.6±33.07) ولمرضى قصور الغدة الدرقية (3.0±31.92)، لم يكن هذا الفرق ذو دلالة عالية ولا فرق مهم احصائيا لهاتين المجموعتين ($p=0.293$)، لكن بالمقارنة مع مجموعة الاصحاء (1.43±21.72) كان هنالك فرق احصائي عالي ($p\leq0.001$). المتوسط الحسابي للكولسترول في مرضى الهاشيموتو كان (54.7) ولمرضى قصور الغدة الدرقية (47.9) و للاصحاء (15.1)، كان المتوسط لكل المجموعات ذو دلالة معنوية عالية (≥0.001). الكالسيوم كان ايضا بمتوسط حسابي (0.86) لمرضى

الهاشيموتو و (0.91) لمرضى قصور الغدة الدرقية و (0.95) للاصحاء وكانت نتيجة المتوسط الحسابي للثلاث مجاميع ذات دلالة معنوية عالية (≤0.001) ومهمة جدا احصائيا. اما بالنسبة لنتائج البروتين سي التفاعلي فكانت هي الاخرى مهمة جدا احصائيا وذات دلالة معنوية عالية (p≤0.001)) عندما قورن الوسيط الحسابي للثلاث مجاميع وكالتالي، مرضى الهاشيموتو (11.2) ومرضى قصور الغدة الدرقية (6.2) مع الوسيط الحسابي للاصحاء و الذي هو (1.91). **الاستنتاجات:** لم يكن هنالك فرق معنوي لمؤشر كتلة الجسم بين مرضى الهاشيموتو ومرضى قصور الغدة الدرقية. ولكن الفرق المعنوي كان عند مقارنة المجموعتين مع الاصحاء. بروتين سي التفاعلي والكولسترول والكالسيوم كانوا مختلفين بفرق معنوي مهم بين المجاميع الثلاثة.

الكلمات المفتاحية : مرضى الهاشيموتو,ثايروكسين,قصور الغدة الدرقية المناعي,التألق المناعي غير المباشر,بروتين سي التفاعلي,كالسيوم .

1. Introduction

Thyroid gland, initial endocrine gland to evolve in humans. It originates from the thyroid diverticulum situated on the middle ventral side of the pharynx *(Song et al.,* 2010). The thyroid gland is a hormone-producing organ that regulates metabolism, growth, and serum levels of electrolytes like calcium through the secretion of thyroid hormone and calcitonin (Fitzpatrick and Siccardi, 2018). Hypothyroidism, which is caused by insufficient thyroid function, can be the result of issues within the thyroid gland (primary thyroid disease) or, in rare cases, issues within the hypothalamus or pituitary gland (central hypothyroidism) or external causes, it is a common condition with possible harmful health effects that impact people all around the globe (Corbetta, 2021). Hashimoto's thyroiditis is an autoimmune condition that results in an underactive thyroid, individuals with Hashimoto's thyroiditis often develop autoantibodies against the thyroid's own antigens, such as anti-thyroid peroxidase (TPOAbs), anti-thyroglobulin (anti-Tg), and TSH receptor-blocking antibodies. These autoantibodies result in insufficient production of thyroid hormone as they destroy the thyroid gland tissue *(Phagoora et al.*, 2023). The primary roles of TSH, aside from stimulating the production of thyroid hormones through increased iodide absorption, include producing thyroglobulin and governing the function of thyroperoxidase (Pirahanchi *et al*., 2018). CRP, an acute-phase protein frequently researched, has been found to promote the secretion of inflammatory cytokines in monocytes, and one of significant protein during the inflammatory response (Erden *et al*., 2008). Calcium is the most plentiful mineral in the body, with 98% of the adult's 1200 g found as hydroxyapatite in the skeleton, the rest is distributed in the extracellular fluid (50%) and different tissues, primarily skeletal muscle, calcium levels are kept relatively stable between 8.5 and 10.5 mg/dl (4.3 to 5.3 mEq/L or 2.2 to 2.7

mmol/L), different laboratories may have variations in normal values and reference ranges up to 0.5 mg/dl (Goldstein, 1990). Cholesterol is a vital part of the human body, necessary for all cell membranes and the creation of various hormones, bile acids, fats, and fat-soluble vitamins. Furthermore, it helps to support the normal functioning of the brain (Gliozzi *et al*., 2021).

The aim of this study is to investigate the difference between inflammatory and biochemical test in Hashimoto patients.

2. Materials & Methods

2.1. Patients and samples.

The case-control study included 50 patients with Hashimoto, 50 Hypothyroidism patient and 50 control healthy. The patient reports are based on Clinical manifestation and laboratory investigation including (Tsh, T3, T4 and TPOAbs). A blood sample was obtained via vein puncture with disposable syringes, extracting 10 ml of blood from each individual. Blood was gathered in a glass tube without anticoagulant and an EDTA tube with anticoagulant. The serum was separated by centrifugation at 3000 rpm for 5-10 minutes after the gel tube was incubated at room temperature and clot formation occurred.

2.2. Evaluations of CRPL3, Ca and Cholesterol level

CRPL3 by Cobas C311while Ca and cholesterol test was measured by a manual test kit / Mindray BA-88A.

2.3. Ethical approval

The study was approved by the ethical committees of the Middle Technical University College of Health and Medical Techniques.

2.4. Statistical analysis

The Statistical 26 program in SPSS was utilized for analyzing the impact of various parameters. Comparison between One-way ANOVA and Kruskal-Wallis test.

3.Results.

3.1. Characteristic of the study groups.

The studied groups were distributed as Hashimoto group (Female 34.3% , Male 27.5%) , Hypothyroidism (Female 31.3% , Male 38.0%) and the control group (Female 34.3% , Male 27.5%) , The distribution of the study groups and their gender by numbers and percentages were shown in Table (1).

Table 1: Categorical distribution for studied groups.

Gender	Frequency (%)			Total
	Hashimoto group	Hypothyroidism group	Control	
Female	34 (34.3)	31 (31.3)	34 (34.3)	99 (100)
Male	16 (27.5)	19 (38.0)	16 (27.5)	51 (100)
Total	50 (33.3)	50 (33.3)	50 (33.3)	150 (100)

3.2. BMI in studied group.

Conducting a one-way ANOVA test to assess the differences in BMI among the group, hypothyroidism group, and control group. A significant difference was observed between the studied groups, with a p-value of less than or equal to (≥0.001). The Bonferroni test was employed to ascertain the specific nature of these differences. This analysis found that the average BMI of the Hashimoto group (33.07±4.6) and hypothyroidism group (31.92±3.0) did not show a significant statistical difference (p=0.293), but both groups had a highly significant statistical difference (p≤0.001) in comparison to the control group's BMI (21.72±1.43) as illustrated in Table (2).

Table 2: Comparison between BMI (Mean ± SD) for the studied groups.

Variable	Mean ± SD			
	Hashimoto group (n=50)	hypothyroidism group (n=50)	Control (n=50)	P-value
BMI	33.07±4.6	31.92±3.0	21.72±1.43	≤0.001***

***** Highly statistically significant at p≤0.001**

3.3. CRP acute-phase protein measurement.

CRP statically measured by the Kruskal-Wallis test, by calculating the median for each studied group, CRP median in HT was (11.2), hypothyroidism (6.2) while control group (1.91). The results showed very highly statistically significant differences (p≤0.001) when the levels of these parameters were compared among Hashimoto group, Hypothyroidism group, and Control group. Figure (1) below illustrate the pairwise comparisons between groups to assess the significance level and identify the specific differences between groups. Each node displays the average ranking of the group's samples. Blue lines show a significant difference at p≤0.05 of lower; green lines show no significant difference at p≥ 0.05.

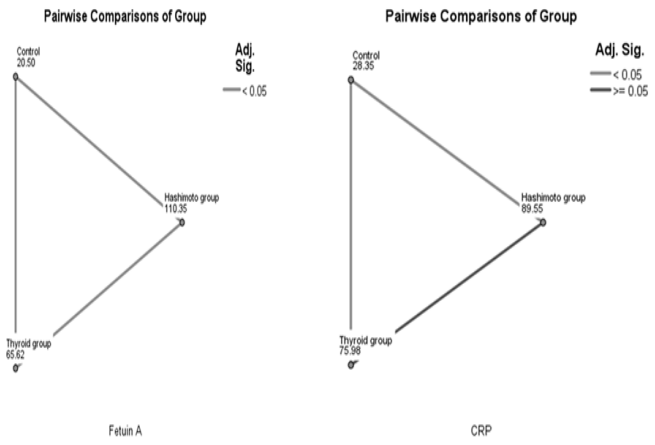

Figure (1) Pairwise comparisons for CRP between groups

3.4. Ca and Cholesterol test.

Cholesterol and CRP are important markers. The findings indicated an extremely significant difference (p≤0.001) when comparing the levels of these parameters between the HT group, hypothyroidism group, and control group. Calcium median results were (0.86) for HT, (0.91) for hypothyroidism patients while (0.95) for control group all were highly significant statically (≤0.001), median for cholesterol serum levels in HT (54.7) while in hypothyroidism (47.9) and the control group (15.1), the P-value for the three groups was (≤0.001) highly significant. Figure (2) below illustrate the pairwise comparisons between groups to assess the significance level and identify the specific differences between groups. Each node displays the average ranking of the group's samples. Blue lines show a significant difference at p≤0.05 of lower; green lines show no significant difference at p≥ 0.05.

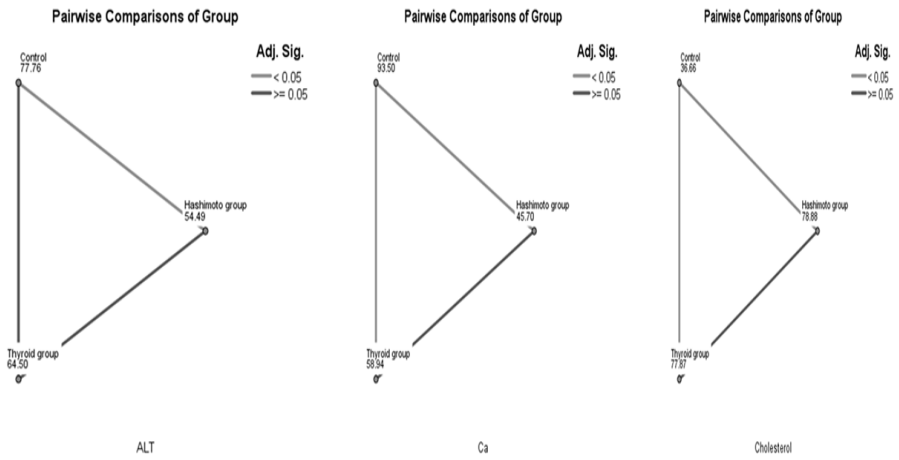

Figure (2) Pairwise comparisons for Cholesterol and CRP between groups

4. Discussion

The BMI was significantly difference between HT and hypothyroidism patient than those in control group (p≤0.001). Women with Hashimoto disease exhibited noticeably elevated body weight, resulting in an increased BMI (Chao *et al*., 2020). A study conducted by (Wagh *et al.,* 2020) observed a correlation between BMI and thyroid function in women. CRP also was elevated in both HT and Hypothyroidism than in Control group (p≤0.001), acute-phase protein frequently researched, has been found to promote the secretion of inflammatory cytokines in monocytes. One more significant protein during the inflammatory response (Erden e*t al.*, 2008),therefor, the CRP median in HT was higher than Hypothyroidism patient . In addition, Ca and Cholesterol serum level also extremely significant difference (p≤0.001) when comparing the levels of the HT group, Hypothyroidism group, and Control group. In current study we demonstrated low levels of Serum levels of calcium, it also was decreased notably in patients with Hypothyroidism in the other study (Sultana *et al.*, 2024). Cholesterol in our study was higher in HT patient (p≤0.001) as in (Kurtkulagi *et al.*, 2021) who show elevation in Cholesterol in inflammatory conditions diseases ,while in Hypothyroidism it was elevated more than the Control group and less than the HT with median for HT (54.7) , Hypothyroidism (47.9)) as (Song *et al*., 2021) who mentioned that, individuals with Hypothyroidism and baseline total cholesterol levels above 200 and 240 mg/dL have a 6 and 15 times higher chance of increasing, respectively. Rats fed a high-cholesterol diet indicated high cholesterol but without high triglycerides, along with increased serum TSH. The rise in serum TSH due to excess cholesterol is gradual and time-dependent, and is not related to changes in triiodothyronine or thyroxine levels.

5. Conclusion

The study revealed that individuals with HT and Hypothyroidism have a higher Body Mass Index (BMI) compared to healthy people. At the same time, there were statistically significant changes in C-reactive protein, as well as in other biochemical markers (Ca and Cholesterol).

6. References

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