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Hypothyroidism Risk and Its Correlation to Metabolic Parameters

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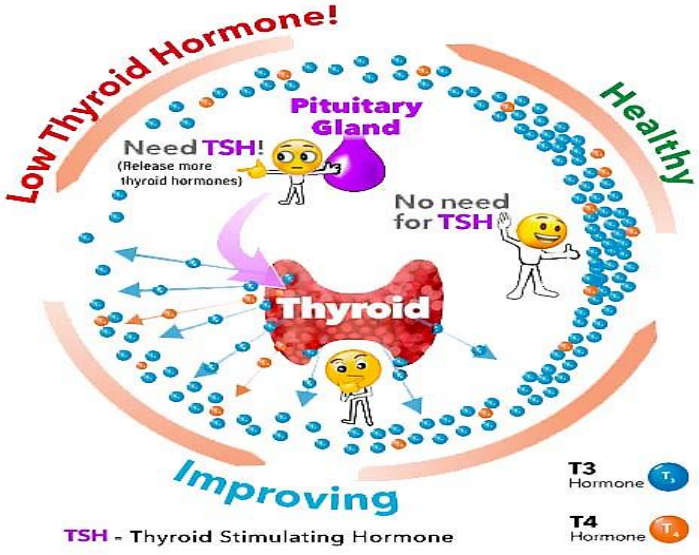
ABSTRACT

Hypothyroidism has become more prevalent in recent years. This rise might be attributed to changes in the metabolic features of the individuals. The goal of this study was to see if there was a connection between thyroid nodule (enlarged thyroid) cancer and metabolic indicators. This intersectional survey was conducted between January and May, 2018, in Al-Kafeel Hospital/Iraq. Thyroid fine-needle biopsy and thyroid surgery samples were gathered from patients. Patients in group 1 had benign pathologies, but those in group 2 had malignant pathologies. Thyrotropin, fasting insulin, and Insulin Resistance Homeostasis Model (IRHM) were all assessed in both groups before surgery. Statistical analysis was carried out. Based on findings, eighty-four patients were included in the study. There were 41 individuals of the Benign Ganglia Group (BGP), and 43 members of the Malignant Nodes Group (MNG) who were all significantly more important in the Thydnodl.

GRAPHICAL ABSTRACT



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Introduction

The most prevalent endocrine cancer is Lymphoma. Lymphoma has become more common in the past few years [1]. This rise is unexplainable merely by more regular diagnostic testing. This rise might be attributed to changes in patients' metabolic characteristics. The relationship between the malignancy propensity of thydnodls and metabolic indicators consistently piqued the curiosity of scientists [2]. This condition is not completely understood. In the past few years, the prevalence of lymphoma has risen in tandem with the rise in insulin resistance. Elevated insulin, due to its mitogenic actions, has been connected to the growth of cancer. The also observed that patients with differentiated Lymphoma had more insulin resistance than the controlled group [3, 4].

The thyroid stimulating hormone is a hormone that activates thyroid cells. The thyroid stimulating hormone stimulates the growth of cancer in thyroid follicle cells by promoting hypertrophy and hyperplasia. Thyroid stimulating hormone increase may be a risk factor for MNG in those with thydnodls. Thyroid stimulating hormone reduction is used to limit tumor development in patients with differentiated thyroid carcinoma. Thyroid stimulating hormone increase and lymphoma may have a favorable association, according to research [5]. The purpose of this research was to determine the relationship between thydnodl malignancy and metabolic indicators. The article was organized as follow: Section 2 presented Materials and Methods. Section 3 provided Diagnosis of Hypothyroidism. Section 4, discussed thyrotropin and in Section 5, the Statistical Analysis was presented, Section 6 included Findings and Discussion, and also Conclusion was provided in Section 7.

Materials and Methods

Patient selection

This cross-sectional research was carried out between January and May in 2019-2020. The study included patients who received a thyroid fine-needle biopsy and a complete thyroidectomy owing to a thydnodl.

The research involved a total of eighty-four patients. The patients were separated into two groups based on their age, gender, and BMI. Pathologically BGG patients (n=41) were in group 1, while pathologically MNG patients (n=43) were in group 2.

Table 1: Shows the patient characteristics and endocrine parameters

	The First Group (BGG)	The Second Group (MNG)	P-value
Parameters	43 (51%)	42 (50%)	
Women's/Men's	33/8 (80.5%) / (19.5%)	36/7 (83.72%) / (16.28%)	> 0.46
The average of age (year)	42.26 ± 13.66	40.001 ± 13.26	> 0.46
Thyroid stimulating hormone (μIU/mL) The median (max-min)	0.39 (0.0-9.01)	1.65 (0.0-8.7)	p < 0.01
Insulin (μIU/mL) The median (max-min)	8.77 (3.01-24.83)	13.85 (4.90-39.73)	p < 0.46
IRHM The median (max-min)	2.33 (1.27-7.2)	3.04 (1.13-14.02)	p < 0.46

Inclusion criteria

Individuals between the ages of 18 and 65 years old (male and female), "euthyroid patients", patients with the minimal 1 > 1 cm thydnodl, and patients receiving operation were those involved in this study.

Exclusion criteria

Pregnancy, individuals with non-euthyroid, various cancers, diabetes mellitus, and chronic inflammatory illness were considered as the exclusion criteria. Before surgery, insulin levels in patients after fasting, thyroid stimulating hormone, and IRHM (insulin fasting x glucose fasting/405 Insulin sensitivity is 2.7) were determined. The local ethics committee authorized the research (Dicle University 2019/84). Before participating in the trial, all patients signed an informed consent form.

Diagnosis of Hypothyroidism, Surgery

A tissue sample was needed for thorough histopathologic characterization and categorization of hypothyroidism. Because genetic and molecular phenotyping are now regularly conducted as a part of the pathologic diagnosis, the requirement for the appropriate tissue has increased. An entire lymph node should be biopsied whenever feasible. An open excisional biopsy is done in individuals with palpable peripheral lymphadenopathy, excluding inguinal lymph nodes if similarly worrisome adenopathy is found elsewhere. When a patient has no peripheral lymphadenopathy, but enlarged intrathoracic, intraabdominal, or retroperitoneal lymph nodes that would be difficult to biopsy with a simple open biopsy, this is a common occurrence. Attempts have been made, like in many other sectors of medicine, to identify less invasive techniques of removing tissue for diagnosis.

Thyrotropin

Thyrotropin, commonly known as thyrotropin, is a hormone that regulates the activity of other hormones. The thyroid stimulating hormone is a hormone that stimulates the synthesis of two major hormones, T4 (thyroxine) and T3 (triiodothyronine). Thyrotropin levels typically vary from 0.4 to 4.0 milliunits per liter (mU/L), according to the American thyroid association. The upper limit varies per laboratory, although in most situations, it is between 4 and 5 mU/L [6, 7].

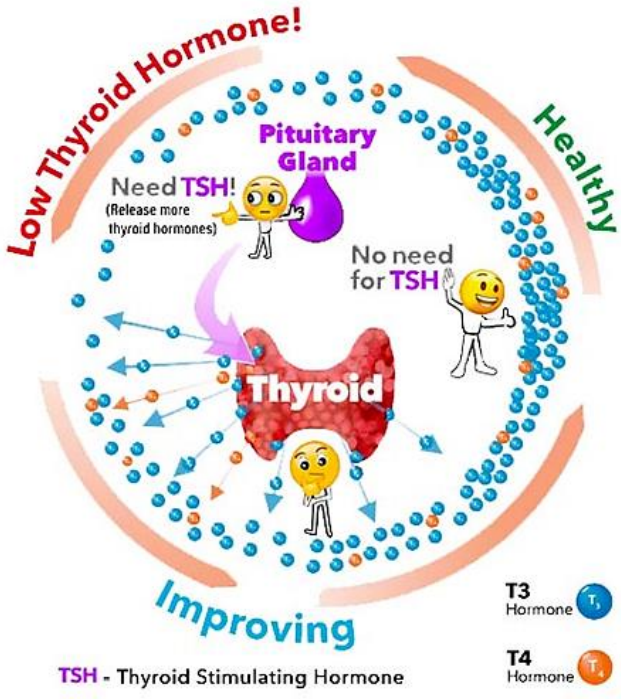

Figure 1: thyroid Stimulating Hormone

Thyroid Screenings

Thyroid hormones may be measured through blood tests, which are widely available and utilized. Not all thyroid tests are appropriate for every condition [8].

Thyroid Stimulating Hormone Test

Thyroid function is best measured in a blood sample by measuring thyroid stimulating hormone levels. Thyroid stimulating hormone variations can serve as an "early warning system," occurring before the body's actual thyroid

hormone levels reach dangerously high or low levels [9]. Thyroid stimulating hormone levels over normal indicate that thyroid gland is not making enough thyroid hormone (primary hypothyroidism). A low thyroid stimulating hormone level, on the other hand, typically means the thyroid is overproducing thyroid hormone (hyperthyroidism). A low thyroid stimulating hormone can be caused by a pituitary gland defect that prevents it from producing enough thyroid stimulating hormones to activate the thyroid gland (central hypothyroidism). A normal thyroid stimulating hormone reading indicates that the thyroid is working correctly in the majority of healthy people [10, 11].

T3 Screening

T3 tests assess the amount of triiodothyronine (T3) in the blood. The bound and free fractions of triiodothyronine are measured in a total T3 test. Total T3 levels are commonly high in hyperthyroid individuals. T3 testing can help confirm a hyperthyroidism diagnosis and identify the degree of hyperthyroidism [12, 13].

T4 Screening

The bound and free thyroxine (T4) hormones in the blood are measured by a Total T4 test. Free T4 is a metric that measures what is not bound and may freely enter and alter human tissues (Table 2) [14].

Table 2: Laboratory findings and their causes

Lab Findings	Causes
The thyroid stimulating hormone is high, while thyroid hormone levels are low.	Hypothyroidism (hypothyroidism)
Thyroid hormone levels are normal, but the thyroid stimulating hormone is elevated.	Hypothyroidism in the subclinical stage
The thyroid stimulating hormone is low, but thyroid hormone levels are high.	The thyroid gland generates too many hormones in primary hyperthyroidism.
The thyroid stimulating hormone is low, but thyroid hormone levels are normal.	Hyperthyroidism (mild or early)
Thyroid hormone levels are high, while thyroid stimulating hormone is low. Followed by thyroid stimulating hormone levels are low, while thyroid hormone levels are high.	Thyroiditis is a condition that affects the thyroid gland (Thyroid Inflammation)
Thyroid hormone levels are low because of a low thyroid stimulating hormone.	Pituitary illness is a condition that affects the pituitary

Statistical Analysis

The patient data was imported to the SPSS 22.0 software for statistical analysis. Mean and standard deviation (SD) was utilized to express the mean and standard deviation of categorical and normal distributions, respectively. The patient data was imported to the SPSS 22.0 application for statistical analysis. The Mann-Whitney U test was used for non-parametric data. 0.05 was utilized as the significant threshold [15, 16].

Results and Discussion

The study included eighty-four patients (W/M: sixty-nine women (82.1 %) and 15 men (17.9 %). The mean age was 40.13 ± 10.81 (18-64) for the BGG, with forty patients (W/M: 34/8") and forty-three patients in the MNG (W/M: 36/7). The BGG had a mean age of 40.49 ± 10.84 (18-64), while the MNG had a mean age of 39.79 ± 11.23 (18-64). Between the two collectives ($p > 0.46$), there was no variation in the women to men proportion or age. Thyroid stimulating hormone levels in the MNG were substantially greater than 1.65 (0.0-8.7) compared with BGG 0.39 (0.0-9.01), and this distinction was significant statistical ($p<0.01$). Fasting insulin levels in MNG were substantially greater at 13.85 (4.90-39.73) than in the BGG at 8.77 (3.01-24.83) and this difference was

statistically significant (p<0.46). As can be seen in Table 1, MNG had a considerably higher IRHM level of 3.04 (1.13-14.02) than BGG of 2.33 (1.27-7.2), which was statistically significant (p < 0.46). The most prevalent endocrine cancer is lymphoma. Age, gender, and genetic susceptibility remain unaltered risk factors for lymphoma. Lymphoma is becoming more common with time. The prevalent utilization of ultrasonography may not just reflect this rise. The precise cause of its recurrence is uncertain. In our investigation, we discovered a connection between insulin levels and cancer. Fasting insulin levels were greater and statistically significant in MNG individuals. Excessive insulin, due to its mitogenic properties has been connected to the growth of lymphoma in studies. Furthermore, [5] discovered a relation between insulin levels, IRHM, and the incidence of papillary lymphoma. Insulin resistance was discovered by [6] to have promoted nodule development and progression via angiogenesis and elevated intranodal blood flow. This discovery implicates that the development of new blood vessels is related to insulin resistance. In our investigation of cancer patients, the IRHM score, which is made up of insulin and glucose, was shown to be greater. Moreover, [7] discovered that insulin resistance is three times more common in people with differentiated lymphoma than those with CtrlGrp and that IRHM and lymphoma have a positive connection.

Table 3: The study population's thyroid values and volume

Variables	Patient group (n = Sixty Three)	Controlled group (n = Eighty Three)	Values for reference	P-values
LDL cholesterol (mg/dL)	100.62 ± 24.03	103.11 ± 27.73	0–195	0.87
HDL cholesterol (mg/dL)	51.03 ± 17.12	50.52 ± 15.01	46–101	0.85
Total cholesterol (mg/dL)	180.02 ± 40.32	189.97 ± 41.02	0–195	0.18
Triglyceride (mg/dL)	100.56 ± 50.21	85.02 ± 49.51	0–195	0.03∗
IRHM	3.04 ± 0.34	2.32 ± 1.14	<1.89	0.081∗
Fasting glucose (mg/dL)	87.72 ± 4.99	89.33 ± 7.64	69–109	0.93
2 h glucose (mg/dL)	111.32 ± 15.64	105.01 ± 17.02	<195	0.71
Insulin (μU/mL)	10.12 ± 2.48	9.12 ± 3.11	3.2–25.4	0.001∗
fT3 (pg/mL) fT4 (ng/mL)	3.13 ± 0.54	3.19 ± 0.50	2.2–5.3 0.93–1.7	0.63 0.72
thyroid stimulating hormone (μIU/mL) Anti-TPO (IU/mL)	1.52 ± 0.61 22.01 ± 13.01	1.24 ± 0.20 24.38 ± 9.12	0.73–3.98 0–44	0.21 0.72
Fibrinogen (mg/dL)	240.02 ± 80.13	251.26 ± 62.03	176–350	0.54
Sedimentation rate (mm/h)	19.73 ± 8.39	20.49 ± 11.05	0–20	0.66
CRP (IU/mL) Thyroid volume	2.76 ± 4.98	2.55 ± 5.54	0–6	0.82 0.03∗
(mL)	18.23 ± 2.93	16.95 ± 3.90		

Insulin resistance and lymphoma recurrence have been related, according to [7, 9]. The thyroid stimulating hormone is capable of causing cancer by stimulating thyroid cells. Patients with advanced cancer had higher mean thyroid stimulating hormone levels, according to our research. This difference was significant from a statistical standpoint. According to [13], a high level of thyroid stimulating hormone is related to a higher risk of thydnodl malignancy. The found that blood thyroid stimulating hormone levels were greater in thydnodl patients, which was related to high chances of differentiated thyroid carcinoma and advanced tumor phase. Through

biopsy findings and thyroid stimulating hormone levels in about 10,000 individuals with thydnodl biopsy, the discovered a high association between thyroid stimulating hormone levels and malignancy. Thyroid stimulating hormone levels that were less than 0.4 micro U/ml were determined to be in the BGG range (Table 3) [3].

Conclusion

Thyroid stimulating hormone elevation and insulin resistance have been linked to an increased risk of thydnodl cancer. The levels of the thyroid stimulating hormone, insulin, and IRHM were indicated to be higher in lymphoma patients. Thyroid stimulating hormone elevation, insulin resistance, and a high IRHM all contributed to the lymphoma development.

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Authors' contributions

All authors contributed to data analysis, drafting, and revising of the paper and agreed to be responsible for all the aspects of this work.

Conflict of Interest

There are no conflicts of interest in this study.

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