

CORRELATION BETWEEN THE DISORDER OF THE THYROID GLAND, OBESITY AND OVERWEIGHT IN THE FEMALE GENDER

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Abstract

Introduction: The thyroid gland is the endocrine gland responsible for the production of thyroid hormones, a regulator of growth, development and basal metabolic rate of the organism. It also has a wide range of physiological effects on the organism such as: general thermogenesis, physiological metabolic effects, growth and developmental features and when these parameters move up and down they lead to acute or chronic pathology.

Pathologies of the thyroid gland are very frequent diseases in our country, especially in the female gender. As far as diseases are concerned, when we have iodine deficiency, imbalance of thyroid hormone values such as an increase that leads to hyperthyroidism or a decrease in values that leads to hypothyroidism, other diseases such as Hashimoto's, Graves etc.

Obesity is a state of metabolic disorders, sometimes considered a disease in which excess body fat is accumulated to such an extent that it can negatively affect human health.

Obesity is related to the function of the thyroid gland and this metabolic disorders is a very frequently in reproductive female.

Body BMI is measured with a metric formula where body weight (in kg) divided by body height (in m²) set to the square power gives us the body index-BMI (%) measure.

Purpose of the study: This paper aims to investigate the correlation of thyroid gland disorders and hormonal imbalance with the phenomenon of body weight as the main causes of this metabolic disease .

Material and method: The research will take a total of 80 patients, they will be divided by gender and age groups into three categories. The first group will include patients from: 15 to 20 years, the second group from: 21 to 50 years and the third group from: 51 to 70 years. From the patients included in the research, blood samples will be taken and the hormones will be analyzed: TSH, FT₄, FT₃ also BMI will be measured. The data will be processed with serum and will be analyzed by means of the modern automatic method enzyme Fluorescent Immunoassay (Biomerie). The BMI of the body will be measured with a metric formula where the weight of the patient (in kg) divided by the height of the patient (in m²) set to the square power will give us the measure of body index-BMI (%).

SPSS – Software package version 20.0

Numerical series were analyzed using central tendency measures (average, median, minimum values, maximum values), as well as distribution measures (standard deviation);

To determine the regularity of the frequency distribution of the examined variables, the Shapiro-Wilk W Test was used;

Non-parametric tests for two independent parameters were used to test the significance and difference between some numerical parameters with irregular frequency distribution (Mann Whitney U test);

To determine statistical significance, a two-way analysis was used with a significance level (means) of $p < 0.05$.

Research results: Endocrine disorders are more frequent and appear faster in the thyroid gland. Statistics show that there are millions of people affected by these metabolic syndrome problems. The results of the research will give a real insight into the function of the thyroid gland, the state of the level of hormonal status and the impact of metabolic syndrome of BMI, which can lead to hormonal imbalance and metabolic disorder.

Conclusion: From the analyzes performed on patients of different age groups and genders, we come to the conclusion that:

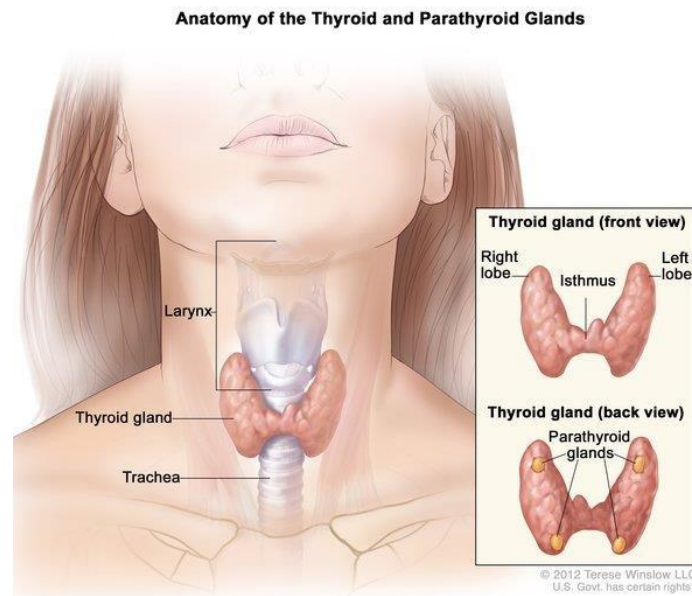
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- Hormonal disorders of the thyroid gland can be the main cause of the BMI factor,
 - The correlation of thyroid hormone status and metabolic status are in continuous correlation with obesity, overweight, infertility, diabetes and hyperlipidemia.
 - These changes of the thyroid gland and the BMI can have negative consequences for human health such as in osteoporosis and electrolytes imbalance.
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Keywords: thyroid gland, obesity, hyperthyroidism, hypothyroidism, metabolic syndrome, BMI.

1. Introduction

The thyroid gland is the largest gland of the endocrine system, despite the fact that it weighs 15-20 g in an adult individual, the importance of this gland is extraordinary. The thyroid gland is responsible for mental and physical development both during the embryonic period and in other stages of life (Adler JT, et al 2008).

The thyroid gland is like a mini-factory that processes iodine, where iodine is obtained mainly through food and water and after entering the body is absorbed by the thyroid gland, which processes iodine and later produces iodine-based hormones (Gaspard U, et al 2009).



Thyroid hormones strengthen metabolic processes, have anabolic action, promote protein synthesis, stimulate the activity of many enzymes, promote development and differentiation processes, they participate in gluconeogenesis, glycolysis and lipolysis. They reduce the amount of triglycerides and cholesterol, have an effect on the decrease of body weight, also increase the consumption of oxygen, remove water and Na in the kidney, have a role in increasing pulmonary ventilation, etc.

THYROID PHYSIOLOGY

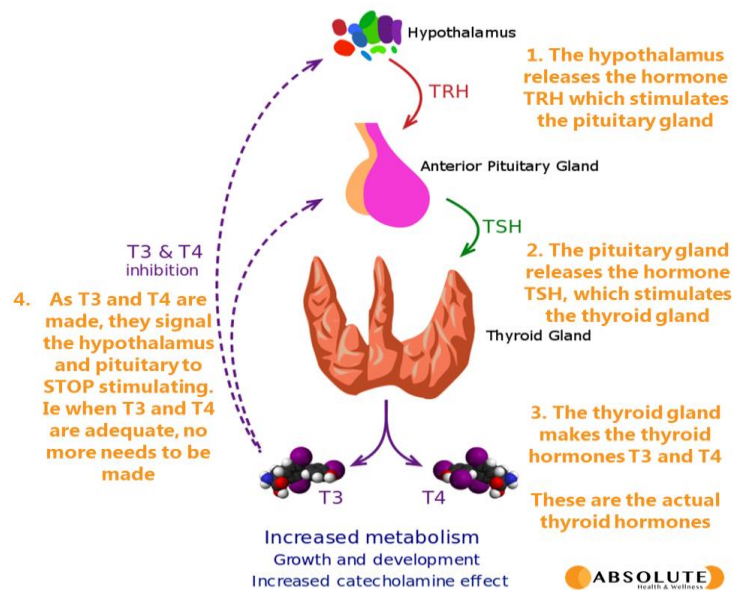


Figure 2. Physiology of the thyroid gland (<https://absolutehealthparis.com/healthy-thyroid-function/>)

Thyroid diseases can occur at any age, but are more common after the 5th decade of life. We can say that there is a preference to touch the female sex more than the male sex. The figures reported from examinations and visits show that women are 3-4 times more often affected than men. While we cannot say that there is no single factor that has an impact on this type of prevalence, many things are still unclear about why women are affected more than men by this disease.

Diseases of the thyroid gland are very difficult to treat, especially when they appear during childhood or during pregnancy. Thyroid diseases, if they are not diagnosed in time and if they are not treated at the right time, pose a serious threat to the lives of these patients. This is because the aggravation of the disease passes into severe forms, leaving serious consequences in health. Due to the importance that this gender has for the organism, if it does not function properly in addition to its severity, it leads to the appearance of many problems that also hinder the work of other organs (Ding QF, et al., 2007).

Body mass index (BMI), a measurement based on a person's height and weight, allows the classification of individuals into categories such as obese or overweight. With these classifications, we can assess risk for hypertension, diabetes, cancer, hypercholesterolemia, and other chronic diseases.

Furthermore, childhood BMI serves as a prediction method for health and disease later in life. Along with BMI, researchers also study waist circumference and waist-to-hip ratio in correlation with the above-mentioned chronic illnesses. This brief review explores the associations between body mass index, waist circumference, and the waist-hip ratio as measurements and their ability as predictors for persistent conditions like diabetes and hypertension (Khanna D, et al 2022).

BMI as a measurement is typically used to gauge the risk of developing chronic conditions such as diabetes, hypertension, depression, and cancer. (Khanna D, et al 2022), (Oniszczenko W, et al 2019), (Khanna D, et al 2017), (Khatib M, et al 2021), (Adriana C, et al 2016).

The BMI calculation will fall within a numerical range, which places an individual into one of four categories.

Category	BMI
marasmus	Less than 16,5
Underweight	from 16,5 to 18,5
Healthy	from 18,5 to 25
Overweight	from 25 to 30
Obesity	from 30 to 35
Obesity clinic	from 35 to 40
Morbid obesity	More than 40

Figure 3. BMI numerical range table reference

(https://www.researchgate.net/figure/Reference-of-BMI-with-the-degree-of-obesity_tbl1_234037873)

This data is used by researchers and physicians to educate patients and the public of potential health risks detected within a specified category (Clark DO, et al 1997).

Researchers continue to evaluate the correlation between BMI and long-standing illness as well as associations between waist circumference as a predictor of health (Levers K, et al 2013).

2. Purpose of the study

This paper aims to investigate the correlation of thyroid gland disorders and hormonal imbalance with the phenomenon of body weight as the main causes of this metabolic disease. Recently, the prevalence of thyroid gland disorders is increasing in both men and women, including different age groups of people, including also the young age group and the disorders of this gland are expressed by overweight and obesity.

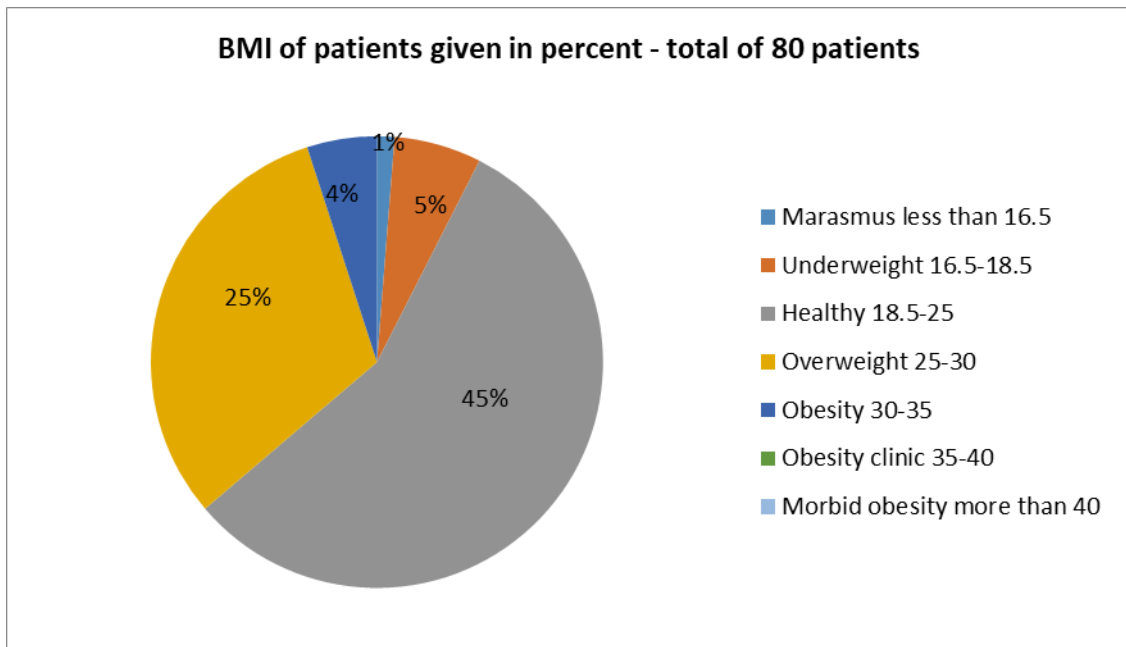
Our goal was to get information based on the results obtained for the increased prevalence of metabolic disorders in the population, especially in the young age as a result of the imbalance of thyrostimulating hormones, thyroxin and triiodothyronine.

3. Material and method

The research will take a total of 80 patients, they will be divided by gender and age groups into three categories. The first group will include patients from: 15 to 20 years, the second group from 21 to 50 years and the third group from 51 to 70 years. From the patients included in the research, blood samples will be taken and the hormones will be analyzed: TSH, FT₄, FT₃ also BMI will be measured. The data will be processed with serum and will be analyzed by means of the modern automatic method enzyme Fluorescent Immunoassay-Vidas (Biomerie). The BMI of the body will be measured with a metric formula where the weight of the patient (kg) divided by the height of the patient (m²) set to the square power will give us the measure of body index-BMI (%).

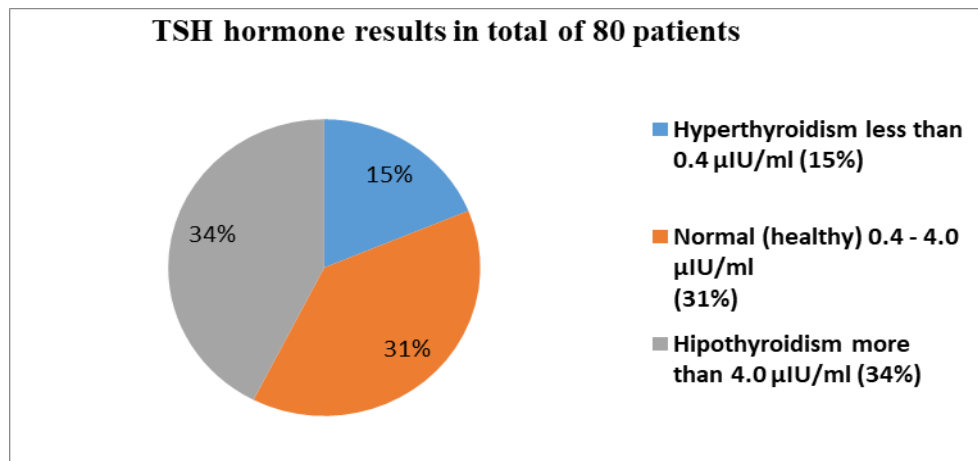
4. Results

Based on the obtained results for the thyroid gland and the body mass index of different human age groups, we have presented them in the graphics below.



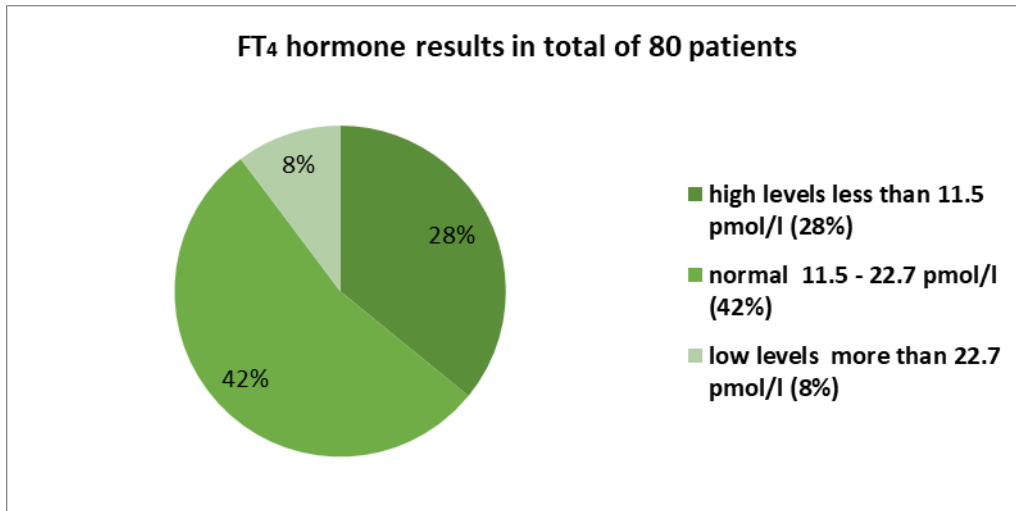
Graph 1: Body mass index levels in patients given in percent.

In the graphic above we can clearly see the BMI results of patients, and we can notice an amount of patients who take place in the overweight category and some patients in obese category. From the total number of patients taken in the research, we conclude that only 1% of patients are in marasmus category, 5% of patients are underweight, 45% are healthy, 25% are overweight, 4% are obese patients, we don't have patients with obesity clinic and morbid obesity.



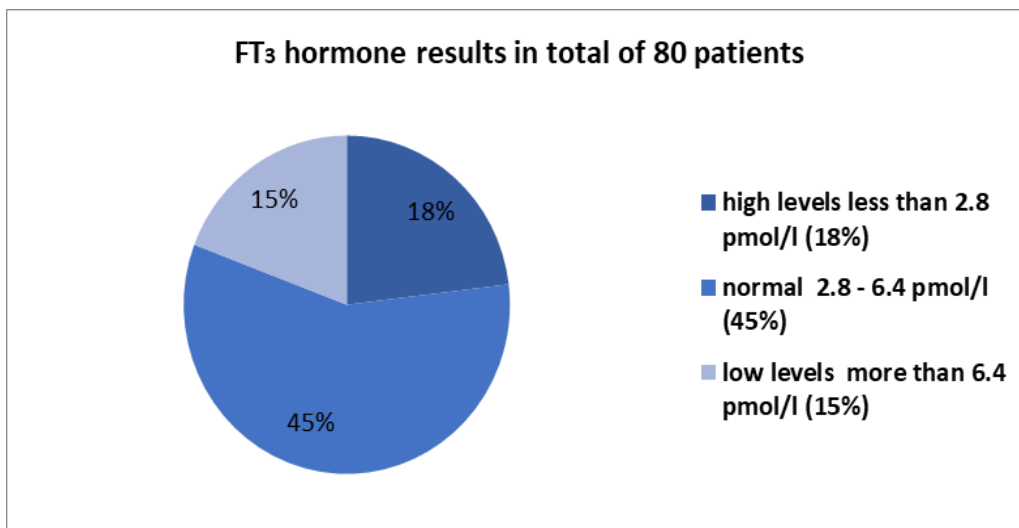
Graph 2: TSH hormone results in patients given in percent.

From the graphic we can see that 15% have hyperthyroidism, 31% of patients have normal values of thyroid stimulating hormone and 34% of patients have hypothyroidism. The significance between hypothyroidism and BMI is in a very high correlation one with the other.



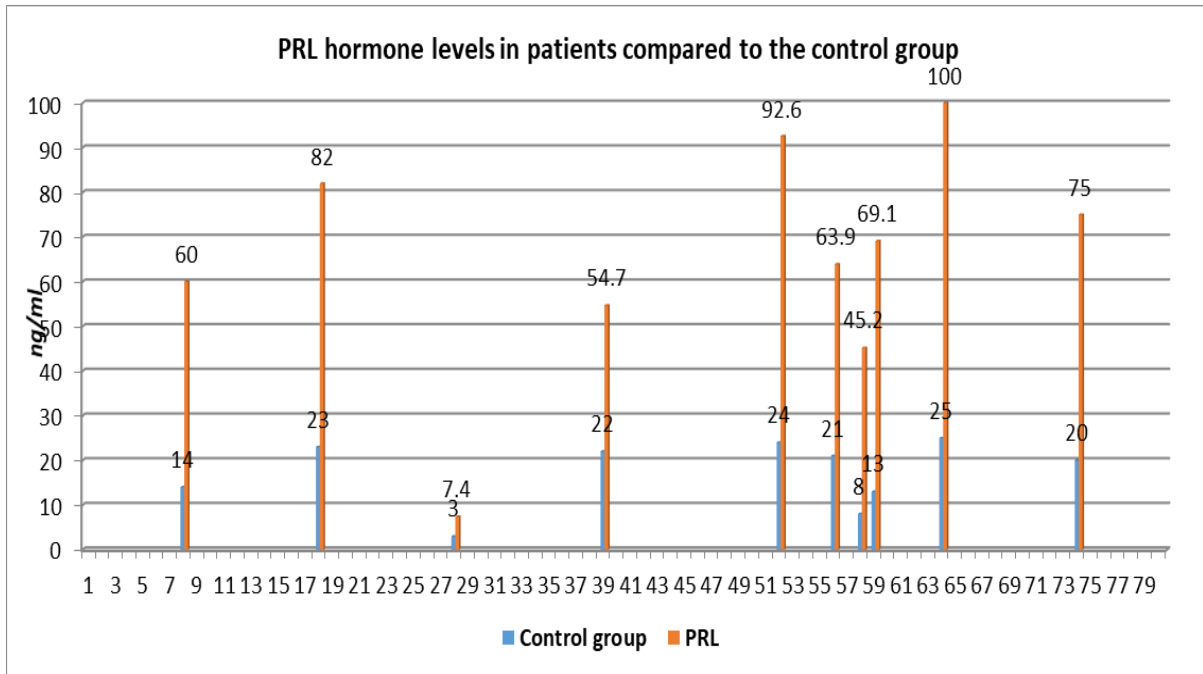
Graph 3: The level of FT₄ in patients.

From the presented results, we conclude that 28% have high FT₄ values, 42% have normal values and 8% of patients have low FT₄ values that correlate with the above results of thyroid stimulating hormone.



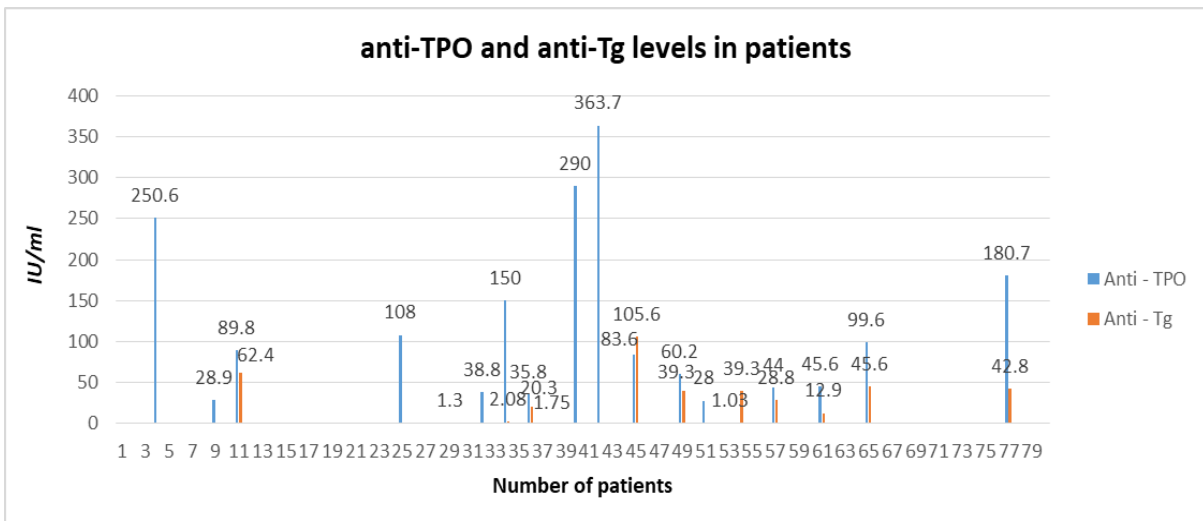
Graph 4: The level of FT₃ in patients.

In the graphic above we have a clear view of FT₃ levels, we conclude that 18% are patients with high values of FT₃, 45% are normal FT₃ values and 15% are with low FT₃ values, which correlates with thyroid stimulating hormone and overweight and obesity.



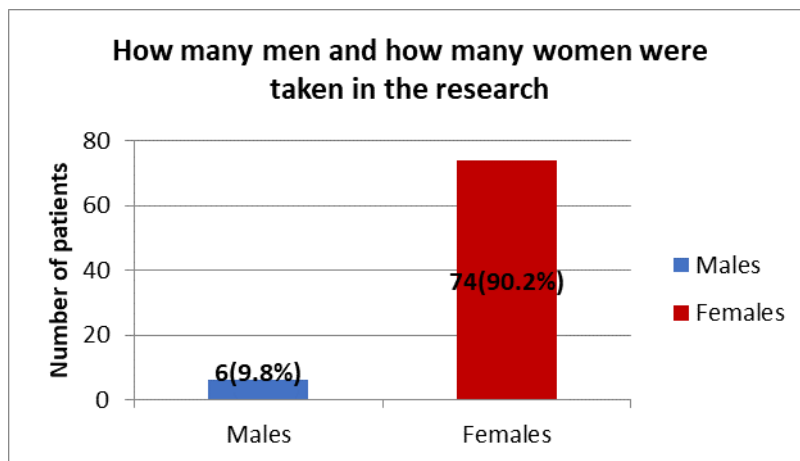
Graph 5: PRL hormone levels in patients compared to the control group.

At a group of patients PRL hormone is at a high level compared to the control group, which indicates diseases and their connection has to do with thyroid disorder, obesity, overweight and other metabolic syndrome imbalance problems in their body health. In patients with disorders of the thyroid gland, we observed a significant correlation between the obtained results of high level of prolactin and thyroid hormones.



Graph 6: anti-TPO and anti-TG levels in patients.

We can see correlation that some patients have really high anti-TPO levels and Anti-Tg which helps us to conclude that it is related to imbalance of thyroid status and we suspect it's coming from obesity as a metabolic disorder and imbalance of thyroid hormones.



Graph 7: How many males and females were taken in the study?

In general there were 80 patients where from them 74(90.2%) were females and 6(9.8%) were males.

5. Discussion

The thyroid gland is particularly susceptible to environmental influences and, therefore, is unique among the endocrine glands as far as direct environmental impact. The thyroid gland becomes hyperplastic and a goiter develops when there is severe nutritional iodine deficiency. This is the reverse of the usual meaning of toxic effects of a substance on an organ. In fact, the abnormality occurs when there is an insufficient amount rather than an excess of one of the important chemicals needed for that particular gland. Another aspect of toxicology of the thyroid is the fact that when the normal regulatory mechanisms with the usual feedback control of thyroxin secretion fail, very high levels of thyroxin develop with resultant hyperthyroidism or, more appropriately for this conference, thyrotoxicosis.

Another environmental hazard which affects the thyroid gland uniquely is the factor of external radiation of the region of the thyroid gland during infancy and childhood. The common practice of giving radiation therapy to the region of the thymus gland in infants has resulted in the occurrence 55 of cancer of the thyroid gland in greater number of young people than could be expected from chance alone. Radiation therapy for lymphoid tissue in the tonsillar region of the nasopharynx and for acne also contributes to an increased incidence of cancer (Edmund B. Flink, 1981).

Body mass index (BMI), a measurement based on a person's height and weight, allows the classification of individuals into categories such as obese or overweight. With these classifications, we can assess risk for hypertension, diabetes, cancer, hypercholesterolemia, and other chronic diseases (Deepesh Khanna, et al 2022).

Hashimoto's disease is listed among the most common endocrine causes of obesity. Hashimoto's disease is also known as autoimmune thyroiditis or chronic lymphocytic thyroiditis. It is the most common type of thyroiditis and autoimmune endocrinopathy, constituting the most common non-iatrogenic cause of hypothyroidism (Swain M. et al., 2005).

The condition is more prevalent in the female population, and anti-TPO antibodies are more common in women (13.9%) than in men (2.8%) (McLeod., et al 2012).

Lucyna Ostrowska et al., Weight gain is frequently the first symptom of hypothyroidism. Obesity is a huge global health problem, and the ever-growing number of people with excess body weight is a challenge for doctors and nutritionists. On the one hand, this situation requires specialists to take measures to prevent the growing obesity epidemic, and on the other

it forces them to seek more effective forms of obesity treatment and weight reduction—in our case in women with Hashimoto’s disease.

Lucyna Ostrowska et al., also stated that their research shows improvement of thyroid parameters in patients suffering from obesity and Hashimoto’s disease is possible through effective weight reduction. Concurrently, an individually adjusted elimination diet may lead to better therapeutic results (Ostrowska et al., 2021).

6. Conclusion

Basal metabolism and the function of the thyroid gland are the main regulators of the maintenance of a healthy organism, also the normal functioning is influenced by stress, diet, physical activity as key factors in the maintenance of a healthy organism.

In general there were 80 patients where from them 74(90.2%) were females and 6(9.8%) were males. BMI of patients analyzed in the research group compared to the control group give us the possibility to see BMI results of patients and we can notice an amount of patients who take place in the overweight category and some patients in obese category.

In the graphic above we can clearly see the BMI results of patients, and we can notice an amount of patients who take place in the overweight category and some patients in obese category. From the total number of patients taken in the research, we conclude that only 1% of patients are in marasmus category, 5% of patients are underweight, 45% are healthy, 25% are overweight, 4% are obese patients, and we don’t have patients with obesity clinic and morbid obesity.

The analysis of the obtained results shows that from the total number of patients investigated and who have sought the help of an endocrinologist for body mass index, we see that 31% of patients have normal values of thyroid stimulating hormone, 15% have hyperthyroidism and 34% have patients have hypothyroidism. The significance between hypothyroidism and BMI is in a very high correlation one with the other.

From the presented results, we conclude that 8% of patients have low FT₄ values, 28% have high FT₄ values and 42% have normal values that correlate with the above results of thyroid stimulating hormone and with obesity and overweight in general. In the graphic above we have a clear view of FT₃ levels and normal FT₃ values are presented with 45%, high values with 18% and low FT₃ values with 15%, which correlates with thyroid stimulating hormone and overweight and obesity.

At a group of patients prolactin hormone is at a high level which indicates diseases and their connection has to do with thyroid disorder, obesity, overweight and other metabolic syndrome imbalance problems in their body health. In patients with disorders of the thyroid gland, we observed a significant correlation between the obtained results of high level of prolactin and thyroid hormones.

We can see the correlation that some patients have really high anti-TPO levels and Anti-Tg which helps us to conclude that it is related to imbalance of thyroid status and we suspect it’s coming from obesity as a metabolic disorder and imbalance of thyroid hormones.

We recommend to all human populations that diet and physical activity are two main components in maintaining the normal functioning of the thyroid gland, obesity and overweight.

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