

ABSTRACT

Introduction

According to data from the Central Statistical Office of Poland from 2014, thyroid diseases are one of the most common chronic diseases in women in Poland. Almost 11% of Europeans suffer from thyroid disorders, but many people are unaware of the disease due to the presence of non-specific symptoms, especially in the course of subclinical hypothyroidism. Hypothyroidism is one of the most common diseases of the endocrine system and occurs in about 18% of people over 60 years of age, but recently there has also been an upward trend in the incidence of young women. Statistically, this disease occurs 5-8 times more often in women than in men.

According to research, hypothyroidism is usually associated with weight gain, a decrease in thermogenesis and resting metabolism rate. The consequences of these disorders are, among others, an increased risk of obesity, dyslipidemia or type II diabetes. However, few studies also take into account other factors that may affect the development of the above-mentioned diseases and problems with maintaining a healthy body weight in this group of patients, including diet and physical activity.

Aim of the study

The aim of the study was to assess the resting metabolism rate and the analysis of nutrients supplied with the diet and their correlation with calorimetric parameters and body weight composition in healthy women and treated for hypothyroidism / and Hashimoto's disease.

In addition, the relationship between body mass composition and resting metabolic rate with levels of hormones, cholesterol, triglycerides and blood glucose were also investigated.

Material and methods

The study involved 102 women, including 51 patients diagnosed with hypothyroidism / and Hashimoto's disease receiving chronic levothyroxine treatment (LT4) in an individual dose. The control group was matched in a 1:1 ratio, age (closest birth date) and BMI (the closest value) to the women in the study group.

Measurements were made of height, body composition, resting metabolic rate and lifestyle analyzes, including diet and physical activity. The concentration of cholesterol, triglycerides and glucose were tested in both groups. Information about the level of TSH and thyroid

hormones were obtained from the participants of the study on the basis of current test results carried out in certified medical laboratories.

The statistical analysis of the research results was performed using the Statistica 12 PL statistical package.

Results

Women in the study group had significantly lower lean body mass ($p = 0.0424$), total body water ($p = 0.0325$) and extracellular water ($p = 0.0247$). In addition, they had a statistically significant higher content of adipose tissue and a lower content of intracellular water and the predicted mass of bone minerals. The values of resting metabolism rate and other parameters obtained using the calorimeter did not differ significantly between the study and control group ($p = 0.6124$). A statistically significant positive correlation was found between fT_3 and the RMR level ($R = 0.49$) in the study group. There was no correlation between the level of energy consumed with food and resting metabolism rate – neither in the study group ($R = -0.02$; $p = 0.8922$), nor in the control group ($R = 0.10$; $p = 0.4695$). There were no statistically significant differences in the values of the parameters of the lipid profile and glucose concentration between the study group and the control group. Higher body weight and adipose tissue content significantly positively correlated with higher values of the lipid profile in both groups. There were no statistically significant differences between the intakes of the basic nutrients, with the exception of lactose ($p = 0.0046$), which was consumed to a significantly lower amount by women from the study group. It was observed that women from the control group reported higher spontaneous physical activity on a daily basis. Women with hypothyroidism and Hashimoto's disease who declared this type of activity had a lower level of visceral adipose tissue ($p = 0.0622$). Women in the study group who declared a longer duration of a single physical activity, approx. 60 minutes, were characterized by lower values of biochemical parameters such as: TC ($p = 0.0174$), LDL ($p = 0.0008$), TC/HDL ($p = 0.0024$), non-HDL ($p = 0.0011$), glucose ($p = 0.0111$), and TSH ($p = 0.0601$). Higher supply of calcium, iodine, vit. D and vit. K was significantly negatively associated with the content of adipose tissue.

Conclusions

1. Women with thyroid gland disease were characterized by a similar metabolism to women in the control group. Thus, a lower level of resting metabolism rate is probably not the cause of problems with maintaining a healthy body weight. Therefore, special

attention should be paid to other factors that may affect the increase in adipose tissue content in patients treated for hypothyroidism.

2. Women with hypothyroidism / and Hashimoto's disease were characterized by lower lean body mass and intracellular water content, and thus probably also lower muscle mass. For this reason, both dietary management and planned physical activity should be aimed at increasing and / or maintaining muscle mass. In the case of women who need to reduce body weight, it is necessary to plan both an optimal reduction diet and physical training that will allow for gradual loss of body fat and at the same time minimize the risk of losing muscle mass during this process.
3. Body composition has a significant influence on the level of resting metabolism rate in women with hypothyroidism / and Hashimoto's disease. The higher the body weight, BMI, body fat and lean body mass, the higher the RMR value. Therefore, in order to increase the metabolism, attention should be paid to the total daily energy expenditure, which is significantly related to the energy expenditure for physical activity.
4. On the basis of the obtained results, it is not possible to unequivocally state the influence of TSH concentration on body composition in women with hypothyroidism / and Hashimoto's disease. However, a high content of adipose tissue, including visceral adipose tissue, significantly influences higher values of total cholesterol, LDL and triglycerides and is associated with lower values of HDL cholesterol. In order to compensate for disturbances in the lipid profile, the attention should be paid on reducing the amount of adipose tissue in these group of patients. The relationship between body composition and glucose concentration cannot be completely ruled out, as such a relationship was observed in the control group, who also had abnormalities in the lipid profile associated with high adipose tissue content.
5. The conducted analysis did not confirm the relationship between energy consumption and body composition in the study group. However, higher intake of calcium, iodine, vitamin D and vitamin K significantly resulted in lower body weight values and body fat content. Therefore, the use of a balanced diet, covering the needs of the above-mentioned nutrients in women with hypothyroidism / and Hashimoto's disease, it may positively affect the course of weight loss.
6. The obtained results did not allow to observe a significant relationship between physical activity and the level of TSH in women with hypothyroidism / and Hashimoto's disease. On the other hand, spontaneous physical activity was associated with significantly lower levels of LDL cholesterol and glucose, and the longer its duration, the lower the

values of LDL cholesterol, triglycerides and glucose were observed. Therefore, patients with thyroid disease should engage in this form of physical activity on a regular basis to reduce the risk of developing comorbidities.

7. There was no correlation between the resting metabolism rate and the parameters of the lipid profile, glucose concentration and TSH level. However, increasing the total daily level of energy expended may positively affect the maintenance of the correct values of the parameters tested in the group of women with hypothyroidism / and Hashimoto's disease.
8. A relationship was observed between the amount of nutrients supplied and the rest metabolism in both groups. Changing the proportion of nutrients in the diet consisting in reducing the supply of carbohydrates, increasing the consumption of protein and the supply of phosphorus at the level of the recommended dietary allowance may significantly increase the resting metabolism rate in the group of women with hypothyroidism / and Hashimoto's disease.
9. Physical activity did not affect the value of resting metabolism rate, but it significantly increases the total daily energy expenditure, thus leading to the reduction of body fat. Both the study and control groups showed a positive effect of physical activity on body composition. Spontaneous physical activity was associated with lower levels of visceral adipose tissue in the group of women studied. Therefore, women with hypothyroidism / and Hashimoto's disease should regularly engage in this form of physical activity.
10. Women with hypothyroidism and Hashimoto's disease did not provide enough energy in their diet on a daily basis. As a result, they may experience disturbances in the secretion of thyroid hormones, a deficiency of essential nutrients and the development of coexisting diseases.
11. Women with hypothyroidism and Hashimoto's disease did not provide all the minerals and vitamins necessary for the proper functioning of the thyroid gland. For this reason, there is a great need for nutritional education aimed at shaping correct habits among the surveyed women.