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THYROID STATUS IN OBESITY PEOPLE

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ABSTRACT: The study was to determine the relationship between levels of thyroid-stimulating hormone (TSH) and total thyroxine with body mass index and waist circumference in overweight and obese men and women. This study was carried out within the framework of the NARIE project. A population subsample of 280 people (125 men (44.6%) and 155 women (55.4%)) was analyzed. In the combined group of people with II and III degrees of obesity (body mass index 35 kg/m2 or more), higher TSH values were determined. In women with a body mass index of 30 kg/m2 or more and abdominal obesity (according to the criteria of NCEP ATP III, 2001), the average values of total thyroxine are significantly higher than in the group with normal and overweight. Men with more pronounced obesity (body mass index 35 kg/m2 or more) also showed a significant increase in total thyroxine. In the female subsample, in contrast to the male, a weak positive correlation between the values of total thyroxine and waist circumference was determined.

Key words: Thyroid stimulating hormone, thyroid gland, body mass index, abdominal obesity.

INTRODUCTION

Obesity is one of the most serious medical, social and economic problems of modern society. The World Health Organization has declared it an epidemic of the XXI century. The causes of this epidemic are still a matter of debate, but they are certainly related to changes in modern lifestyles, which implies profound transformations in the energy balance. Although it has been well known for decades that thyroid hormones play a key role in regulating the energy of homeostasis, the obesity epidemic has "manifested" a new interest in the relationship between thyroid function and body weight. More than 100 years have passed since the first clinical description of body weight loss inthyroid hyperfunction and its normalization against the background of treatment of the disease. However, unfortunately, there is still no generally accepted explanation for this phenomenon. Epidemiological data, although limited, usually show a high prevalence of overt and subclinical hypothyroidism (approximately 20%) in obese individuals, and hypothyroidism is usually associated with overweight body weight. Weight loss is a typical sign of thyroid hyperfunction. Overweight patients often come to doctors for an appointment, who believe that small changes in thyroid function have a significant impact on body weight. Usually, in such patients, a change in thyroid function is considered the cause of obesity. Foreign and domestic researchers are actively studying hormonal parameters in obese people. A lot of work has been done to study thyroid dysfunction in obese people. Some studies report on changes in the parameters of thyroid function in obese individuals, thus supporting the hypothesis of a regulatory cycle involving the pituitary gland, thyroid and adipose tissue, but quantitative and qualitative assessments of such changes lead to the opposite data. The conflicting results could be partly explained by the fact that most studies included patients with a wide range of overweight. Thus, it remains relevant to study the level of thyroid hormones in people with excess body weight and obesity. The purpose of the study is to determine the relationship

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between the levels thyroid-stimulating hormone (TSH), total thyroxine (total. T4) with body mass index (BMI) and waist circumference (OT) in overweight and obese men and women.

MATERIALS AND METHODS OF RESEARCH

A representative sample of

the population of Samarkand residents surveyed as part of the international HAPIEE study (Determinant of cardiovascular diseases in Central and Eastern Europe: cohort study, 2021-2023). The calculation of the required sample size was carried out according to the recommendations of population studies, taking into account literature data on the prevalence of subclinical hypothyroidism and focal thyroid pathology in people over 45 years of age at the level of 7-10% (Canaris et al., 2000). The sample size is calculated using the formula (Lakin G.F., 1990): n = t2 • p • (100 – p)/2, where n is the sample size; t is the normalized deviation associated with a particular level of significance (for a significance level of 0.05 t = 2); p is the percentage of disease prevalence; – the maximum error value (no more than 3%). According to the research protocol HAPIEE and according to the above formula, the sample size was calculated to ensure the level of statistical significance ($p < 0.05$). 56 people aged 45-69 years were examined, including 25 men and 31 women. From all patients included in the study, informed consent was obtained to perform functional, instrumental examination methods. Everyone underwent a full physical examination, TSH and total were determined. T4, BMI and OT indicators. Determination of the basal level of TSH, total. Serum T4 was performed using standard Immunotech kits (Czech Republic) using an immunochemiluminescent method on a luminometer-photometer LM01A device (Immunotech, a Bekman Coulter Company). The reference values of laboratory parameters were taken from the instructions of the kits used. For basal TSH level 0.167–4.05 mEd/l, for total. T4 is 60-160 nmol/l. Height was measured in a standing position, without upper clothes and shoes on a standard height meter. Body weight was determined without outerwear and shoes on standard lever scales that passed metrological control. The measurement accuracy was 0.1 kg. BMI was calculated using the formula: BMI (kg/m2) = weight body weight (kg)/height (m2). Classification was used obesity by BMI (WHO, 1997): BMI 18.5–24.9 kg/m2 – normal body weight, BMI 25-29.9 kg/m2 – overweight, BMI 30-34.9 kg/m2 – I degree of obesity, BMI 35-39.9 kg/m2 – II degree and BMI 40 kg/m2 m2 and more – grade III. Waist circumference was measured at the middle of the distance between the edge of the lower rib and the upper crest of the ilium with a centimeter tape with an accuracy of 1 cm. Abdominal obesity was attributed to values FROM 102 cm or more in men and 88 cm or more in women according to the definition of NCEP ATP III (2001) [5] and 94 cm or more in men and 80 cm or more in women (VNOK, 2008), respectively. Statistical processing of the obtained results was carried out using the SPSS package (V. 13.0). Statistical analysis included descriptive statistics (averages and standard errors), checking the distribution of indicators. The reliability of the differences was assessed by the Student's t criterion (t). In the presence of a distribution other than normal, the nonparametric Mann–Whitney test method was used for two independent samples. The data obtained in the tables and text are presented as relative values – (%), used $\chi 2$ is the Pearson criterion (for normal distributed features), and also as M ± m (M is the arithmetic mean, m is the standard error of the mean). In isolated cases of a distribution other than normal, variables were transformed using logarithm for analysis using parametric criteria. The differences were considered statistically significant at $p < 0.05$.

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THE RESULTS AND THEIR DISCUSSION

In the examined sample of 56 people (both sexes), 15 (26.7%) people had a BMI of 25 kg/m2 or less, overweight -22 (39.2%) people, I degree of obesity – 12 (21.4%) people and II and III degrees – 6 (9.3%, BMI 35 kg/m2 and more). Abdominal obesity (according to NCEP criteria of ATP III) was detected in 41.1% of patients, among men – in 24.8% (31), among women – in 54.2% (25). The definition of TSH is a strategic marker of the functional state of the thyroid gland. Elevated TSH levels were less frequently detected in people with normal body weight – 2 people (2.6%) than in people with varying degrees of obesity – in 11 patients (12.1%) ($p = 0.02$). In 7 (6.3%) overweight people, TSH levels of 4.05 mEd/l and more than; significant differences with the level indicators TSH has not been established with patients of other groups. The average TSH level in both sexes at the age of 45-69 years old was 1.8 ± 0.2 honey/l, in women – 2.2 ± 0.3 honey/l, which is higher than in men (1.4 ± 0.1 honey/l) the same age; $p = 0.004$. During standardization by age, higher TSH values were maintained among women compared to men. With age, there was a distinct increase in the TSH content in the blood, which occurred in both men and women. In men and women aged 45-69 years, there was no difference in the average values of the total. T4 ($p = 0.857$). Among men of the 45-54 age group, the average value is total. T4 did not differ from the indicator in the 55-69-year-old group. In women aged 45-54 years, the average value is total. T4 was higher than in women 55-69 years old. In persons of both sexes aged 45-69 years, as well as in women, a weak negative relationship between TSH and total was determined. T4 ($r = 0.163$, $p = 0.006$ and $r = 0.218$, $p = 0.006$). In men, no correlations were found between the values of TSH and total. T4 ($r = 0.085$, $p = 0.346$). However, it is determined that the average level of TSH in women, it does not differ from the indicators in men of the appropriate age, unless the structure of the thyroid gland is changed. Currently, a new area of research has emerged in thyroidology – the relationship of metabolic syndrome (its components, including obesity) with functional and morphological disorders of the thyroid gland. In ongoing studies, a link has been found between obesity and functional changes in the thyroid gland, thus confirming the hypothesis that changes occur in the chain consisting of the hypothalamus, pituitary gland, thyroid and adipose tissue. And although in previous studies to assess functional changes in the thyroid gland in obese patients, somewhat contradictory results were obtained, the most systematic observation was the fact that serum TSH levels were higher in obese patients compared with the control group. Conversely, data on the levels of freely circulating TG are contradictory: Studies have shown both an increase and decrease in the level of St. T4 and St. T3. In the formation of groups of subjects (both sexes) with a normal body weight of BMI 25 kg/m2 or less, overweight BMI 25-29.9 kg/m2 , I degree of obesity (BMI 30-34.9 kg/m2) and II and III degrees of obesity (BMI 35 kg/m2 or more), indicators of the level of TSH have significant differences. In the group with a BMI of 35 kg/m2 or more, the average value is TSH 3.7 ± 6.2 mEd/l is higher than in people with normal (1.5 ± 1.6 mEd/l), overweight (1.7 ± 2.1 mEd/l) and in the group with grade I obesity (1.7 ± 1.7 mEd/l) ($p = 0.001$, $p = 0.001$, $p = 0.001$, respectively). The same changes were noted in women. In men with a BMI of 35 kg/m2 or more, we did not obtain a significant increase in the average TSH level, whichmay be due to the small number of patients in this group (6 people). The indicators of the total are analyzed. T4 in patients with varying degrees of BMI. In persons with a Quetelet index of 25 kg/m2 or less, the level of total T4 90.8 ± 1.7 nmol/l, in obese individuals (BMI 30 kg/m2 or more) total T4 is 93.6 ± 1.3 nmol/l ($p = 0.25$). When forming groups of subjects (both sexes) with a normal body weight BMI of 25 kg/m2 or more, overweight BMI of 25-29.9 kg/m2 , I degree of obesity

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(BMI 30-34.9 kg/m2) and II and III degrees of obesity (BMI 35 kg/m2 and more) indicators of the level of total T4 is higher in individuals with a BMI of 35 kg/m2 or more compared to those with normal and overweight. When analyzing gender differences, it was found that men with II and III degrees of obesity (BMI 35 kg/m2 and more) indicators of the level of total T4. It is higher in comparison with the indicators in people with normal and overweight and I degree of obesity ($p = 0.035$, $p = 0.024$, $p = 0.047$, respectively). In women with grade I obesity (BMI 30-34.9 kg/m2), higher values were noted. T4 compared to those in people with normal and overweight. So, in the group with a normal body weight (BMI 25 kg/m2 or less), the average value is total. T4 was 89.7 ± 15.4 nmol/l, with a BMI of 25-29.9 kg/m2 – 90.4 ± 17.3 nmol/l, which is significantly less than in women with a BMI of 30-34.9 kg/m2 – 98.3 ± 21.1 nmol/l, ($p = 0.045$, $p = 0.029$, respectively). In women, a weak positive correlation between BMI values of 35 kg/m2 or more and total was determined. T4 ($r = 0.245$; $p < 0.05$). No correlation was found in the groups with lower BMI values and in men. Waist circumference is a clinical marker of insulin resistance. When evaluatingTSH indicators, total. T4 and the volume of the thyroid gland at different values FROM according to the criteria of NCEP APR III (2001) and VNOK (2008) revealed gender differences. In men, at any values FROM the average TSH values, total. T4 did not differ significantly. In a subgroup of women with abdominal obesity at values FROM 88 cm and less, the indicators are total. T4 is significantly higher than at 88 cm or less ($p = 0.01$). In women, a weak positive correlation between OT and total was revealed. T4 ($r = 0.170$; $p < 0.05$),no such data were obtained in men ($p > 0.05$). Thus, in the group of people with a BMI of 35 kg/m2 or more, the average TSH value is higher than in those examined with normal and overweight and in the group with grade I obesity, these changes were determined in women. The features of hormonal status in women with abdominal obesity, characterized by an increase in the level of total T4, and the dependence is determined: the higher the body weight, the higher the total value. T4. However, it is difficult to answer the question: an increase in the level of total T4 contributes to abdominal obesity or obesity itself leads to a change in indicators. According to the literature, the increase in TSH levels in obese people is explained by various theories and mechanisms. The relationship between elevated TSH and BMI it can also be expressed in the opposite direction. Studies in both humans and animals have shown that adipocytes and preadipocytes express TSH receptors. The effect of TSH on receptors TSH in adipose tissues causes differentiation of preadipocytes into adipocytes, which in turn modulates adipogenesis.

CONCLUSIONS

1. Higher TSH values were determined in the combined group of people with II and III degrees of obesity (BMI 35 kg/m2 or more).

2. In women with a BMI of 30 kg/m2 or more and with abdominal obesity according to the criteria of NCEP-ATP III (2001), the average values of total T4 is significantly higher than in the normal and overweight group.

3. In the female subsample, in contrast to the male, a weak positive correlation of the values of the total was determined. T4 with waist circumference indicators.

4. In men with a BMI of 35 kg/m2 or more, a significant increase was noted. T4.

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