Grot Martina, Szajdewig Magdalena, Grajek Mateusz, Białek-Dratwa Agnieszka, Sobczyk Karolina. Nutritional knowledge of patients diagnosed with endocrinopathies. Journal of Education, Health and Sport. 2022;12(7):596-607. eISSN 2391-8306. DOI http://dx.doi.org/10.12775/JEHS.2022.12.07.059
https://apcz.umk.pl/JEHS/article/view/JEHS.2022.12.07.059
https://zenodo.org/record/6879950

The journal has had 40 points in Ministry of Education and Science of Poland parametric evaluation. Annex to the announcement of the Minister of Education and Science of December 21, 2021. No. The journal has had 40 points in Ministry of Education and Science of Poland parametric evaluation. Annex to the announcement of the Minister of Education and Science of December 21, 2021. No. 32343.
Has a Journal's Unique Identifier: 201159. Scientific disciplines assigned: Physical Culture Sciences (Field of Medical sciences and health sciences); Health Sciences (Field of Medical Sciences and Health Sciences).

Punkty Ministerialne z 2019 - aktualny rok 40 punktów. Załącznik do komunikatu Ministra Edukacji i Nauki z dnia 21 grudnia 2021 r. Lp. 32343. Posiada Unikatowy Identyfikator Czasopisma: 201159.
Przypisane dyscypliny naukowe: Nauki o kulturze fizycznej (Dziedzina nauk medycznych i nauk o zdrowiu); Nauki o zdrowiu (Dziedzina nauk medycznych i nauk o zdrowiu).

Received: 10.07.2022. Revised: 17.07.2022. Accepted: 22.07.2022.

Nutritional knowledge of patients diagnosed with endocrinopathies

Martina Grot[1], Magdalena Szajdewig[1], Mateusz Grajek[2*], Agnieszka Białek-Dratwa[3], Karolina Sobczyk[4]

[1] Faculty of Health Sciences in Bytom, Medical University of Silesia in Katowice, Piekarska 18, 41-902 Bytom, Poland;
[2] Department of Public Health, Department of Public Health Policy, Faculty of Health Sciences in Bytom, Medical University of Silesia in Katowice, Piekarska 18, 41-902 Bytom, Poland;
ORCID: 0000-0001-6588-8598; mgrajek@sum.edu.pl
[3] Department of Human Nutrition, Department of Dietetics, Faculty of Health Sciences in Bytom, Medical University of Silesia in Katowice, Jordana 19, 41-808 Zabrze, Poland;
ORCID: 0000-0002-7798-6424; abialek@sum.edu.pl
[4] Department of Health Economics and Health Management, School of Health Sciences in Bytom, Medical University of Silesia in Katowice, 41902 Bytom, Poland,
ORCID: 0000-0003-1632-7246; ksobczyk@sum.edu.pl

*Correspondence: mgrajek@sum.edu.pl

ABSTRACT:
Background: Thyroid diseases including Hashimoto's chronic lymphocytic thyroiditis represent an increasing epidemiological problem of the 21st century. Thyroid disease is estimated to affect approximately 7.0-9.0 per cent of the population up to the age of 60 years, and as much as 10.0-
12.0 per cent after the age of 60 years. Hashimoto's disease is much more common among women of childbearing age, but it is also increasingly common among children and adolescents. The number of reported cases of autoimmune thyroiditis is steadily increasing. The aim of this study was to assess the nutritional knowledge of female patients with Hashimoto's disease in selected closed online support groups for patients with thyroid disease.
Materials and methods: A self-administered online survey questionnaire was used to conduct the study.
Results: 321 women were enrolled in the study. The largest group of respondents, aged between 20 and 40 years, lived in cities with more than 100 000 inhabitants and had a university education. Hypothyroidism along with Hashimoto's disease was declared by the largest number of respondents. The respondents' main source of nutritional knowledge was the media; the level of knowledge was assessed as insufficient.
Conclusions: There is a need to increase nutritional education among patients in order to reduce the incidence of disease complications, the development of other comorbidities and will allow for health-promoting effects during the pharmacotherapy process.

Keywords: nutritional knowledge; patients; endocrinopathies; thyroid gland

1.INTRODUCTION

Thyroid disease entities are chronic lymphocytic thyroiditis. Epidemiological data indicate that they affect approximately 7.0-9.0% of the population under 60 years of age and 10.0-12.0% after 60 years of age. Definitely more common among the female population with a particular focus on the period during childbearing age. In addition, a pathomechanism of so-called postpartum inflammation within the thyroid gland may occur among 16% of postpartum women. The clinical condition may trigger a remission process or predispose to a full-blown form of Hashimoto's disease [1]. Thyroid hormones show a pleiotropic function already from the prenatal period ensuring the normal physiological development of the embryo and the forming foetus, especially the central nervous system. In addition, they enhance metabolic processes, thermoregulation, influence the genome within contractile protein synthesis, the sodium-potassium pump, calcium pump, as well as extragenically regulating the activity of ion channels in cardiomyocytes. They regulate intestinal absorption of micro- and macronutrients and affect lipid metabolism by enhancing lipolysis in adipose tissue [2]. The following components are essential for the biosynthesis of thyroid hormones: active iodine uptake by the thyroid gland, TSH stimulating the transcription of genes for thyroid proteins, e .g. sodium-iodide symporter (NIS), tyrosine, hydrogen peroxide-activated thyroid peroxidase (TPO) (H_2O_2), thyroglobulin (Tg) located in the follicular cell colloid [2,3]. The process of euthyroidism is regulated by the hypothalamic-pituitary-thyroid system as a negative feedback mechanism [Fig.1].

Secretion occurs as a result of activation at the level of the hypothalamus, the hormone thyroliverin (TRH) stimulating the pituitary through the synthesis of thyrotropic hormone (TSH). Elevated TSH levels in the blood activate the thyroid gland to synthesise and secrete T_4 and T_3 hormones. The inhibitory factor for TSH and TRH secretion is a gradually increasing concentration of thyroid hormones in the blood, while a decrease in their concentration initiates the synthesis of TRH and TSH [4,5].

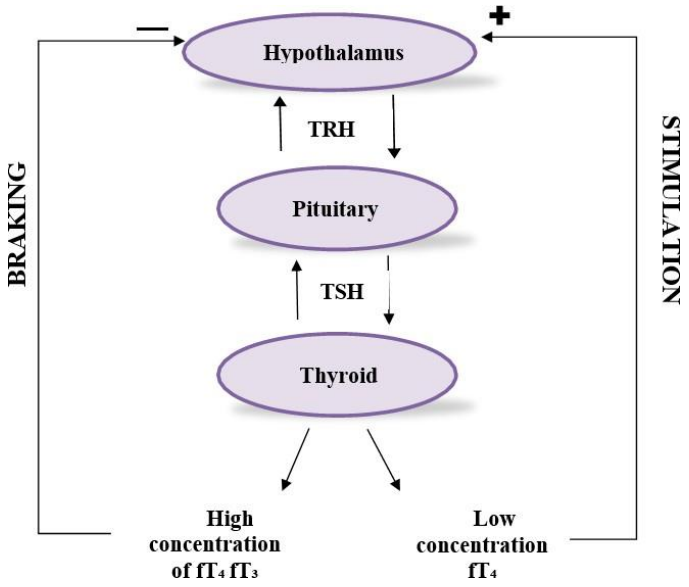

Figure 1 Negative feedback mechanism

Source: own elaboration based on Gardner D.G, Shoback D, editor of science Lewinski A. Greenspan's General and Clinical Endocrinology, Volume I, Lublin: Czelej Publishing House; 2011.

The hormone showing an active effect on target tissues via specific receptors is triiodothyronine (T_3), while thyroxine (T_4) is the prohormone for the synthesis of T_3. Approximately 80.0 per cent of the thyroxine stock is used for this process, of which only 35.0 per cent is converted into the biologically active form T_3, while the remaining 45.0 per cent is the inactive stock form of the hormone known as rT_3 (Reverse Triiodothyronine) [3]. The following disease entities coexist in the pathomechanism of endocrinopathies, i.e. type 1 diabetes, insulin resistance, coeliac disease, pernicious anaemia, Addison's disease, psoriasis, vitiligo, as well as alopecia areata and intestinal dysbiosis. A particularly high correlation is observed between the occurrence of autoimmune thyroiditis and rheumatoid arthritis. Due to the fact that there are numerous comorbidities in patients with a diagnosis of Hashimoto's, a multidisciplinary holistic model should be provided in the therapeutic process [6-9].

According to recent scientific reports, a properly planned nutritional strategy plays a very important role in supporting the pharmacotherapy process. Individually selected nutrition predisposes to inactivation or remission of disease symptoms and significantly improves patients' quality of life. Dietary management in Hashimoto's disease is based on the principles of rational nutrition.

The daily diet should include complete protein, complex carbohydrates with a low glycaemic index and polyunsaturated fatty acids, especially omega-3. It is also important to meet the daily vitamin requirements for normal thyroid function: B_6 B_{12}, A, D, C and E, and minerals, i.e. iodine, selenium, iron and zinc. In the diet of patients, it is important to limit the supply of goitrogenic substances contained in, among others, soya, broccoli, Brussels sprouts, cauliflower, cabbage and turnip greens, and to a lesser extent in pears, millet groats, strawberries, kale and spinach. It is also important to maintain adequate time intervals between taking pharmaceuticals and eating meals. The use of elimination diets among patients with autoimmune thyroiditis is not advisable or recommended. When food intolerances are identified, i.e. lactose intolerance, gluten-dependent conditions, their dietary pattern should be modified accordingly [10,11].

The main objective of this study was to assess the nutritional knowledge of women with hypothyroidism and Hashimoto's disease in selected support groups for patients with thyroid disease. The following specific objectives were adopted to achieve the above aim of the study:

1. Comparison of the study group according to type of condition, education and place of residence.
2. Identification of respondents' sources of nutritional knowledge in thyroid disease.
3. Determination of the relationship between disease entity and BMI.
4. Comparison of respondents' subjective assessment of knowledge with their real-world nutritional knowledge.

2. MATERIAL AND METHODS

2.1. Selection of the study group

The study was conducted with 321 women aged between 17 and 71 years (mean age - 36.6 years) with diagnosed hypothyroidism, Hashimoto's disease, hypothyroidism and autoimmune thyroiditis, and hyperthyroidism. The inclusion criterion was female sex with diagnosed thyroid disease. The exclusion criterion was male sex and subjects without thyroid gland disease. Participation in the study was voluntary and respondents were informed about data protection. The study used a CAWI (*Computer-Assisted Web Interview*) method to select the study sample.

2.2. Research tool

An anonymous open-ended survey questionnaire divided into two thematic sections.

I. Questions related to, among other things, body weight, height, age, place of residence, education and sources of nutritional knowledge, from which the respondents drew their nutritional information and the type of thyroid gland condition of the patients.

II. Single-choice test questions exploring knowledge of the correct diet in thyroid disease.

2.3. Statistical analysis

Analysis of the results obtained was done using Statistica 13. A chi-square test (x^2) was used to assess the significance of differences between the study variables and the significance level was taken as $p=0.05$.

3. RESULTS

3.1. Characteristics of the study group

A total of 321 female members of selected support groups for people with thyroid conditions were enrolled in the study. The age of the respondents ranged from 17 to 77 years. Statistical analysis of the survey participants showed that 50.8 per cent of the respondents had hypothyroidism along with autoimmune thyroiditis of the Hashimoto's type. In addition, 26.2% of the respondents declared h ypoth yroidism and 19.3% of the women had Hashimoto's disease without h y p o t h y r o i d i s m symptoms. Among the respondents, 2.2 per cent were hyperthyroid, while the remaining 1.6 per cent of the respondents did not know which thyroid gland disorder they had.

The overall statistical analysis showed that a significantly higher proportion of respondents with tertiary education was found among women in the 30-40 age group (Table I). They constituted the largest group among the respondents, at 84 respondents. The smallest number of respondents, in the number of 7 respondents, was found to be from the 60-70 age group with tertiary education. The strength of the association between the statistical characteristics defining age brackets and education is weak.

Table I Level of education index by age

Age range	Education					p- value	correla- tion coeffi- cient
	basic	junior high school	vocation	high school	university		
17-30	1 (0.88%)	0	1 (0.88%)	47 (41.6%)	64 (56.6%)	0.034	t(b)=0.024
30-40	0	0	0	29 (25.6%)	84 (74.3%)		
40-50	0	2 (3.7%)	2 (3.7%)	18 (33.3%)	32 (59.3%)		
50-60	0	0	3 (11.54%)	10 (38.46%)	13 (50%)		
60-70	0	0	1 (7.14%)	6 (42.86%)	7 (50%)		
70-80	0	0	0	1 (100%)	0		

In the category of place of residence, the youngest age group, 17-30 years old, constituted the largest group of respondents residing in cities of more than 100 000 inhabitants - 55 out of 321 respondents, which is also the largest group of respondents overall (Table II). The smallest group of respondents was from the oldest age category residing in a city of up to 20 thousand inhabitants (n=1 respondent).

Table II Data on place of residence by age

Age range	Place of residence				p- value	correlation coefficient
	village	city up to 20,000 thousand.	city of 20-100 thousand.	city of over 100,000 thousand		
17-30	32 (28.3%)	11 (9.7%)	15 (13.3%)	55 (48.7%)	0.32	t(b)=0.001
30-40	27 (23.9%)	19 (16.8%)	28 (24.8%)	39 (34.5%)		
40-50	11 (20.4%)	5 (9.7%)	11 (20.4%)	27 (50%)		
50-60	5 (19.2%)	5 (19.2%)	6 (23.1%)	10 (38.5%)		
60-70	4 (28.6%)	2 (14.3%)	2 (14.3%)	6 (42.86%)		
70-80	0	1 (100%)	0	0		

3.2. *Analysis of anthropometric parameters by type of endocrinopathy*

On the basis of the acquired anthropometric parameters, body mass index was calculated according to the formula: BMI = body weight (kg) / body height (m)². The results of the survey, show that among respondents with hypothyroidism and coexisting Hashimoto's disease, BMI is in the range 18.5-24.9 kg/m^2 defined as normal in 40.0% of respondents. Thus, 60.0% of respondents in the same disease entity have an abnormal BMI, i.e. 32.0% have a range of 25-29.9 kg/m^2 - overweight, 22.0% a range of more than - 30 kg/m^2 - obese and 6.0% a range of less than 18.5 kg/m^2 - underweight.

Table III BMI data by disease entity

BMI	Type of disease					p-value	correlation coefficient
	Hypo-thyroidism	Hashimoto's	Hypo-thyroidism and Hashimoto's	Hyper-activity	I don't know		
underweight	2 (2%)	2 (3%)	9 (6%)	0	0	0.28	Vc=0.1
normal	32 (38%)	30 (48%)	66 (40%)	5 (71%)	3 (60%)		
overweight	23 (27%)	18 (29%)	52 (32%)	2 (29%)	2 (40%)		
obesity	27 (32%)	12 (19%)	36 (22%)	0	0		

3.3. Nutritional knowledge

Table IV Data on sources of nutritional knowledge by age

Age range	Source of knowledge				p- value	correlation coefficient
	Staff	media	literature	from other patients		
17-30	31 (27.4%)	53 (46.9%)	24 (21.2%)	5 (4.4%)	0.89	Vc=0.088
30-40	29 (25.6%)	58 51.3%)	21 (18.6%)	5 (4.4%)		
40-50	12 (22.2%)	30 (55.5%)	9 (16.7%)	3 (5.56%)		
50-60	3 (11.5%)	17 (65.4%)	5 (19.2%)	1 (3.8%)		
60-70	2 (14.3%)	8 (57.1%)	4 (28.6%)	0		
70-80	0	1 (100%)	0	0		

The questionnaire assessed knowledge of proper nutrition in selected thyroid disorders. The results of the questionnaire showed that in all age groups, the largest group of respondents derived their knowledge of the topic from media sources (Table IV). The source of knowledge from "other patients" was the least numerous group of respondents in all age groups. The strength of the association between the statistical characteristics defining age ranges and sources of knowledge is weak.

In order to compare factual knowledge with the respondents' subjective assessment, the correctness of the answers ticked by the respondents was verified. Questions 5 to 24 were evaluated by awarding 1 point for a correct answer and 0 points for a wrong answer or do not know. The total number of points was 20. According to the established scale, the following assessment was made of each respondent:

- Very good - 19-20 points
- Good - 15-18 pts
- Fair - 11-14 pts
- Inadequate - ≤ 10

Most people, 49.8%, had a sufficient level of knowledge in the subject area. As many as 31.5% received a failing grade, while good and very good grades were given to 18.4% and 0.3% of respondents respectively.

Verification of the subjective assessment of knowledge of nutrition in thyroid disorders showed that 37.1% of the respondents considered their level of knowledge to be sufficient, 30.2% of the respondents considered their knowledge to be at a good level, and 24.3% of the persons admitted that they had insufficient knowledge in the surveyed area.

4. DISCUSSION

Thyroid diseases including chronic lymphocytic thyroiditis represent an increasing level of morbidity defining it as an epidemiological problem of the 21st century. Hashimoto's disease affects approximately 2% of the population of women of reproductive age, as well as children and adolescents. According to scientific reports, Hashimoto's disease can present in an atrophic form or with the presence of goiter. Autoimmune thyroiditis is characterised by the presence of serum anti-TPO antibodies, anti-Tg antibodies and typical lymphocytic infiltrates in the parenchyma of the thyroid gland, leading to the development of hypothyroidism. Elevated titres of thyroglobulin antibodies are observed in approximately 80% of patients with Hashimoto's disease. In most patients, a number of symptoms can also be observed, i.e. chronic fatigue, lethargy, hair loss, weight gain, palpitations, rapid mood changes and impaired intestinal peristalsis. The aetiopathogenesis of Hashimoto's disease is idiopathic. A genetic, environmental or endogenous spectrum is presumed to underlie this disease, so the pharmacotherapy provided is only a symptomatic factor and not a causal one. With the current state of knowledge, it is not possible to cure the patient of the disease, but only to minimise the symptoms and improve the patient's quality of life [1, 5, 12].

According to recent scientific reports, an appropriately adapted nutritional plan is a key therapeutic element and also allows for a reduction in the dose of hormonal medication. The specific nature of the disease makes it impossible for nutritionists to establish dietary rules for patients with Hashimoto's disease. Each patient should receive an individually tailored nutritional plan in order to obtain the best therapeutic results. Adequate knowledge, dietary habits and food quality have a significant impact on the health and well-being of patients [1].

Analysis of the respondents' BMI showed that 42.1 per cent were of normal weight, with the remaining respondents being overweight or obese.

Due to the slowed metabolism in the hypothyroid phase, attention should be paid to the regularity of meals, the amount of energy supplied and an adequate supply of protein, fats and carbohydrates. As shown by Sorbal et al. in their study, irregular meal intake can have a significant impact on, among other things, more severe symptoms of the disease, i.e. fatigue, lethargy and impaired concentration. A properly composed diet for a patient with Hashimoto's disease should be based onis based on the recommendations of the Healthy Eating and Physical Activity Council in line with the 2020 recommendations of the ICZM, but requires individual adaptation for each patient. When planning the menu, care should be taken to ensure that the number of meals is 4-5 with breaks of 3-4 hours between them. The first meal should be eaten up to an hour after waking up and the last meal should be eaten 2 hours before bedtime. Thyroid hormones are responsible, among other things, for regulating the metabolic rate, which is why in hypothyroidism basal metabolism is reduced by approximately 30.0%, translating into weight gain. A study by Sadowska et al. found that overweight and obesity co-occurred in almost half of the hypothyroid women studied. The analysis by Omeljaniuk et al. confirmed this relationship, which is why it is so important to choose the correct energy balance, individually tailored to the patient.

The diet of patients with autoimmune thyroiditis of the Hashimoto's type should be based on the introduction of components necessary for the proper work of the thyroid gland, i.e. an adequate amount of complex carbohydrates with a low glycaemic index, wholesome protein, omega-3 polyunsaturated fatty acids and antioxidant vitamins A, E, C, vitamin D, B vitamins, as well as minerals beneficial to the patient's health, i.e. iodine, selenium, zinc, iron and calcium. The hormone triiodothyronine is 20.0 per cent converted at the small intestinal level to thyroxine, so the dysbiosis often found in patients with Hashimoto's disease impairs this process. In their work, Kostyukov et al. describe the important role of the beneficial bacterial flora, so the feeding model for patients with Hashimoto's disease should be enriched with fermented dairy products, silages, and in some cases probiotic supplementation is recommended. In planning the dietary strategy, attention should be paid to limiting the intake of ingredients that aggravate thyroid inflammation or impair the effect of pharmacotherapy, i.e. limiting the intake of cruciferous vegetables, and in the case of food intolerances, the diet should be modified appropriately to eliminate allergens, i.e. gluten, lactose and casein [13, 14-16].

According to scientific reports, autoimmune thyroiditis co-occurs with other diseases, the presence of which requires adjustments to the dietary plan. The survey shows that more than half of the respondents (52.0%) derive their knowledge of nutrition from media sources. Often, methods of so-called dietary treatment are communicated that are not always scientifically validated, thus misleading sufferers. The survey asked if there was a positive effect of an elimination diet (gluten-free) diet on the reduction of symptoms of Hashimoto's disease, as many as 58.6% of respondents felt that such a diet had a positive effect on the reduction of disease symptoms. According to scientific reports, the use of a gluten-free diet without coexisting coeliac disease or gluten allergy is not recommended. There are also studies showing the benefits of following a gluten-free diet. Confirmation of this theory is provided by a pilot study by Krysiak et al, which showed a positive correlation of a gluten exclusion diet on the reduction of anti-TPO antibodies. In addition, Kus et al. show in their study that a gluten-free diet is an important factor in helping to combat the symptoms of Hashimoto's disease and a decrease in TSH levels. However, this study was conducted on a small number of patients, so in light of the paucity of findings, further studies in this direction are warranted. It should also be noted that unwarranted adherence to a gluten-free diet and lack of dietary control may expose the patient to a number of nutritional deficiencies. Rybicka et al. describe in their paper that gluten-free diets often provide less fibre compared to gluten-containing diets.

For people with hypothyroidism and Hashimoto's disease, such a dietary pattern. may contribute to an increase in gastrointestinal symptoms, i.e. bloating, constipation. In addition, an improperly balanced gluten-free diet may cause many vitamin deficiencies, including vitamins B and D, as well as minerals such as calcium, iron, zinc and selenium. Commonly available gluten-free products often have a higher glycaemic index than their gluten counterparts, disturbing carbohydrate metabolism and increasing the risk of developing insulin resistance. Given the scientific data indicating numerous nutrient deficiencies of people following a gluten-free diet, the decision to implement this diet should be supported by appropriate diagnostics, and should be carried out under the guidance of a clinical dietitian. [17- 20].

In the diet of patients with thyroid disease, special attention should be paid to an adequate supply of certain vitamins and minerals, i.e. iodine, selenium, zinc and iron.
Analysis of the results of the study by Naliwajko et al. the intake of key micronutrients for thyroid function, e.g. zinc, iodine, calcium, was insufficient. When asked in the questionnaire about sources of iron and vitamin D, patients mostly indicated the correct answer. Furthermore, when asked to indicate the minerals important for normal thyroid function, 79.8% indicated the correct answer. A study by Marchewicz-Zhukowska et al. assessing the vitamin content of the diets of women with Hashimoto's disease showed that they consumed insufficient amounts of vitamin E, D and B vitamins [21, 22].
In the survey conducted, when asked about the benefits of selenium supplementation in Hashimoto's disease, the majority (76.0%) of respondents selected an affirmative answer. It is important to highlight the fact that there are currently no recommendations or recommendations for selenium supplementation. In their study by Kusak et al. investigating the effect of selenium supplementation on thyroid function, they showed that there is insufficient indication for the introduction of supplementation as a component of therapy in Hashimoto's disease. There is therefore a need for further randomised trials to prove the validity of selenium supplementation for Hashimoto's patients. It should be emphasised that excessive use of dietary supplements rich in this or any other element can be hazardous to health, so this should be done under the guidance of a physician or clinical nutritionist [23].
In the diet of people with autoimmune thyroiditis, attention should be paid to the amount of goitrogen-rich foods consumed. The highest content of goitrogens is found in soya, as well as brassica vegetables, i.e. Brussels sprouts, kohlrabi, broccoli, cauliflower and kale. They are also found in smaller quantities in millet, strawberries, pears and spinach. The antinutrients found in the above vegetables can cause disruption in the binding of iodine to thyroxine or triiodothyronine. Consequently, they may contribute to the development of hypothyroidism and increase the risk of goiter. The author's study found that almost 60.0 per cent of respondents did not know what goitrogenic substances were. Furthermore, the respondents could not identify the products in which these substances are found. In assessing the nutritional status and diet of women with thyroid disease, Sadowska et al. showed that some women regularly consumed goitrogen-rich products unknowingly putting themselves at risk of worsening their condition. It should be remembered that by subjecting vegetables to appropriate heat treatment, the amount of goitrogenic substances is reduced by approximately 30.0%, so it is permissible for patients with hypothyroidism to consume these products in limited quantities [15].
In the treatment of hypothyroidism and Hashimoto's disease, attention should be paid to factors impairing the absorption of levothyroxine. In the survey, respondents were asked whether, to their knowledge, there was an adverse relationship between a fibre-rich diet and the effect of the drugs i.e. Eutyrox and Lethrox. 70.4% of respondents did not know the answer to this question and 15.0% chose the wrong answer. In their paper, Kostyukov et al. list foods that interact with drugs, impairing their absorption. Not only do a diet high in fibre, strong coffee and grapefruit juice impair the absorption of drugs, but also a too short interval between a meal and taking a drug is important [16].

The results of the present study showed that the nutritional knowledge of women with various thyroid conditions is insufficient. Furthermore, as the study by Sadowska et al. indicates, patients do not receive nutritional education from their doctor, nor are they referred to a clinical dietician, and they are often not interested in nutritional recommendations in hypothyroidism and Hashimoto's disease. In conclusion, further more comprehensive studies assessing both the nutritional knowledge and eating habits of patients seem to be necessary. It is also necessary to introduce nutritional education as another component of therapy for thyroid disorders [15].

5. CONCLUSIONS

The largest group of thyroid disease patients is the hypothyroid population with autoimmune Hashimoto's thyroiditis, living in cities with more than 100 000 inhabitants, along with a university education. Patients' main source of nutritional knowledge is the media, which recommends the latest dietary regimens not supported by scientific research. Hypothyroidism and Hashimoto's disease have a negative impact on BMI. The co-occurrence of these conditions increases the risk of developing obesity and thus metabolic syndrome in patients with enocrinopathies. Respondents' nutritional knowledge is at an insufficient level, so there is a need to increase nutritional education among patients in order to reduce the incidence of chronic complications and the development of other comorbidities.

REFERENCES

1. Gołkowski F. Aktualne spojrzenie na etiopatogenezę i aspekty kliniczne chorób Hashimoto. Państwo i Społeczeństwo. 2016; 4: 101- 115.
2. Bednarczuk T. Podstawy Endokrynologii. Warszawa: ITEM; 2017.
3. Gardner D.G, Shoback D, red nauk Lewiński A. Endokrynologia ogólna i kliniczna Greenspana, tom I, Lublin: wyd. Czelej; 2011.
4. Szczeklik A, Gajewski P. Choroby wewnętrzne. Kraków: Medycyna Praktyczna; 2009.
5. Zubelewicz - Szkodzińska B. Dietoprofilaktyka chorób tarczycy. [W:] Zubelewicz-Szkodzińska B, red. Dietopfofilaktyka chorób żywieniowozależnych. Katowice: Wydawnictwo SUM; 2017: 91-94.
6. Gier D, Ostrowska L. Choroba Hashimoto a otyłość. Varia Medica. 2019; 3(3): 238–242.
7. Ceyhun V, Tezcan K, Perihan V. Insulin resistance in patients with euthyroid Hashimoto thyroiditis. Biomedical Research. 2017; 28(4): 1543–1547.
8. Włodarek D. Niedokrwistość. [W:] Włodarek D, Lange E, Kozłowska L, Głąbska D, red. Dietoterapia. Warszawa: PZWL; 2014: 431 - 441.
9. Virili C, Poupak F, Antonelli A, Benvenga S, Cantenni M. Gut microbiota and Hashimoto's thyroiditis. Reviews in Endocrine and Metabolic Disorders. 2018; Oct. URL: https://doi.org/10.1007/s11154-018-9467-y.
10. Tuchendler P, Zdrojewicz Z. Dieta w chorobach tarczycy. Med Rodz. 2017; 20 (4): 299303.
11. Zakrzewska E, Zegan M, Michota-Katulska E. Zalecenia dietetyczne w niedoczynności tarczycy przy współwystępowaniu choroby Hashimoto. Bro,at. Chem. Toksykol. 2015; XLVIII (2): 117 – 127.
12. Luty J. Bryl E, Choroba Hashimoto — aspekt genetyczny i środowiskowy. Forum Medycyny Rodzinnej 2017; 11: 1-6.

13. Omeljaniuk W.J. i wsp., Ocena sposobu żywienia pacjentek z chorobą Hashimoto,
„Bromat. Chem.Toksykol.” XLIV, 3, 2011, 428–433.
14. Sorbal M, Palacz – Wróbel M. Świadomość prewencyjnego działania diety oraz nawyki żywieniowe kobiet z chorobami tarczycy w wieku 20-50 lat. Med Rodz 2018; 21(2A): 16-22.
15. Sadowska J, Stawska A. Dietoprofilaktyka chorób współtowarzyszących niedoczynności tarczycy w wybranej grupie kobiet. Bromat. Chem. Toksykol. 2015; XLVIII (4): 690 – 700.
16. Kostiukow A, Rosołek M, Romanowski M, Ignaszak E, Samborski W. Dieta jako istotny składnik wspomagający leczenie choroby Hashimoto. [W:] Maciąg M, Maciąg K. red. Medyczne aspekty kosmetologii i dietetyki. Lublin: Wydawnictwo Naukowe TYGIEL; 2018: 200 – 213.
17. Florczyk I, Florczyk M, Junik R. Dieta bezglutenowa a choroba Hashimoto - obecny stan wiedzy. Forum Zaburzeń Metabolicznych 2018, tom 9, nr 4, 152–159.
18. Krysiak R, Szkróbka W, Okopień B. Wpływ diety bezglutenowej na autoimmunizację tarczycy u nieleczonych kobiet z zapaleniem tarczycy Hashimoto: badanie pilotażowe. Exp Clin Endocrinol Diabetes 2019; 127: 417–422.
19. Kus K, Zielińska K, Zaprutko T, Ratajczak P, Nowakowska E. Choroba Hashimoto – efektywność diety bezglutenowej. Polski Przegląd Nauk o Zdrowiu. 2016; 4 (49). URL: https://doi.org/10.20883/ppnoz.2016.22.
20. Rybicka I, Gliszczyńska – Świgło A. Niedobory składników odżywczych w diecie bezglutenowej. Probl Hig Epidemiol 2016, 97(3): 183-186.
21. Naliwajko S.K, Markiewicz – Żukowska R, Sawicka E, Bartosiuk E, Omeljaniuk W. J, Borawska M. H. Składniki mineralne w diecie pacjentek z chorobą Hashimoto. Bromat. Chem. Toksykol. 2011; XLIV (3): 544-549.
22. Markiewicz – Żukowska R, Naliwajko S.K, Bartosiuk E, Sawicka E, Omeljaniuk W. J. Borawska M. H. Zawartość witamin w dietach kobiet z chorobą Hashimoto. Bromat. Chem. Toksykol. 2011; XLIV (3): 539–543.
23. Kusak R. i wsp. Ocena wpływu suplementacji selenem na wybrane parametry diagnostyczne u pacjentów z przewlekłym autoimmunologicznym zapaleniem tarczycy. Bromat. Chem. Toksykol. 2019; LII (1): 68 – 76