

Health-related Behaviours of Women Diagnosed with *Hashimoto's* Disease

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Abstract The survey was conducted to assess health-related behaviours of women diagnosed with chronic lymphocytic thyroiditis also known as Hashimoto's disease. A correlation was found between the respondents' age and the body mass index. The presence of comorbidities was significantly correlated with both the body mass index and respondents' age. It was shown that respondents with excessive body weight developed cardiovascular diseases more often ($p=0.01$) than the other women. Respondents aged 30-39 years maintained normal body weight more often than the 40-49-year-olds ($p=0.001$). Nearly half of the respondents did not receive additional recommendations ($n=63$, 45.5%) from the attending doctor on supplementation or changes in the lifestyle. The most frequent recommendations included supplementation with vitamin D, introduction of a diet, physical activity, and avoidance of stress. There are still no guidelines for Hashimoto's thyroiditis patients that would systematise the current knowledge of the general treatment of this disease.

Keywords: *chronic lymphocytic thyroiditis, Hashimoto's disease, body mass index, health-related behaviours, dietary supplements, physical activity*

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1. Introduction

Chronic lymphocytic thyroiditis is an autoimmune endocrine disorder accounting for 30% of all autoimmune diseases. It is the most common form of chronic thyroiditis worldwide and a non-iatrogenic cause of autoimmune deficiency. It most frequently affects females from every age group and produces symptoms with varying severity [1,2]. In women, the highest incidence is observed between 45 and 65 years of age [3]. It represents approximately 98% of cases of diagnosed thyroiditis in children and is the most common thyroid function disorder in iodine-rich areas [4]. The rapid increase in the incidence of autoimmune thyroid diseases in the recent decades suggests that environmental factors may be a cause of most cases of the disease. Researchers from different countries have reported an increased prevalence of thyroid autoantibodies and hypothyroidism in patients provided with higher iodine supply vs. those with iodine deficiency [5,6]. One of the key elements for thyroid function is selenium. The thyroid gland contains the highest amounts of this element of all the organs in the body. In Europe, a 50% decrease in the selenium content in the diet has been reported for the last 3 decades [7]. Another factor whose deficiency disturbs the work of the immune system and thus promotes the development of

Hashimoto's thyroiditis is vitamin D3. Its effect on the immune system is associated with the presence of vitamin D receptors in a majority of immune cells, i.e. lymphocytes T and B. Th1 helper cells present in the thyroid in Hashimoto's disease induce cytokine secretion, thereby enhancing apoptosis of follicular cells. Calcitriol contributes to reduction of secretion of cytokines Il-2 and INF- γ by Th1 cells [8].

Abnormal function of the immune system results in production of anti-thyroid peroxidase (anti-TPO) and anti-thyroglobulin (anti-TG) antibodies, which usually leads to hypothyroidism resulting from thyroid follicular cell atrophy [9]. The immune system in Hashimoto's disease patients is dysregulated; hence, they often develop other autoimmune diseases, e.g. vitiligo, rheumatoid arthritis, celiac disease, type 1 diabetes [10,11], anaemia [12], ischemic heart disease, or atherosclerosis [13,14]. The aetiology of the disease is still unknown. Potential factors promoting the development of the diseases include drugs (interferon alpha, amiodarone, and lithium), excess iodine, female sex, pathogenic and viral infections (*Helicobacter pylori*, *Borrelia burgdorferi*, *Yersinia enterocolitica*, Coxsackie viruses, and retroviruses), dysbiosis, and genetic factors. Protective effects and alleviation of the symptoms of the disease are probably provided by e.g. selenium, myo-inositol, vitamin D, and appropriate dietary regimens. Patients suffering from Hashimoto's disease have knowledge of many diets inhibiting the development

of autoimmunity and restoring homeostasis in the organism. The diet should be adjusted primarily with consideration of the patient's individuality (patient's specific needs), foods that may irritate the gastrointestinal tract or accelerate the regeneration of the thyroid gland, and components that mitigate deficiencies [15]. Dietotherapy focuses on various elements of the lifestyle of the treated patient. A holistic approach to a Hashimoto's disease patient requiring comprehensive help in combating the source of the disease is indispensable. Standard medical care is usually focused on relieving symptoms without addressing their origin, which results in progression of the disease. An important determinant of health is the lifestyle and health-related behaviours, e.g. rational nutrition, physical activity, ability to cope with stress, prophylactic examinations, etc. The information on the health-related behaviours in female Hashimoto's thyroiditis patients is an important part of therapy. While pro-health behaviours support health, prevent disease, and promote recovery, anti-health behaviours lead to development of health disorders and negative interactions in the emotional, physical, and psychosocial spheres [16].

2. Material and Methods

The research was conducted with the diagnostic survey method using a custom-made questionnaire and the method for measurement of anthropometric parameters, including BMI. The survey was carried out in a group of Polish women (n=139) aged 30-49 with diagnosed Hashimoto's disease. The questionnaire comprised 24 questions, with 21 closed questions. Verbal informed consent was obtained from all participants. The values of the analysed parameters measured in a nominal scale were expressed in numbers (n) and percentage (%).

2.1. Statistical Analysis

The data were analysed statistically in the Chi-square test with the use of the PQStat program, version 1.6.6 from PQStat Software. A 5% error of inference and the related significance level $p < 0.05$ indicating statistically significant differences or correlations were adopted.

3. Results and Discussion

In the group of the respondents with chronic lymphocytic thyroiditis, 60.43% (n=84) were aged 30-39 and 39.57% (n=55) were aged 40-49 (Table 1). A majority of the respondents lived in the city (n=111, 79.9%) and the others were residents of rural areas (n=20, 20.1%). Almost half of the respondents (n=60, 43.17%) had normal body weight (BMI=18.5-24.9 kg/m²), whereas 35.97% (n=50) were overweight. Twenty-five of them (approximately 17.98%) were obese and four women (2.88%) were underweight. The anthropometric parameters of the respondents are presented in Table 2. The present observations confirm the results reported by Sadowska and Stawska [17] and Omeljaniuk et al. [18]. The 30-39 year-old respondents exhibited normal body weight more often than the women in the 40-49 age group

($p=0.001$) (Table 3). Half of the respondents (n=70, 50.36%) declared other comorbidities accompanying Hashimoto's thyroiditis. The age was an important risk factor for the development of other diseases ($p=0.028$) and abnormal body weight ($p=0.002$) (Table 3).

Table 1. The background characteristics of respondents

	Characteristics	n	%
Age	30-39	84	60,43
	40-49	55	39,57
BMI	17-18,4 kg/m ²	4	2,88
	18,5-24,9 kg/m ²	60	43,17
	25-29,9 kg/m ²	50	35,97
	30-34,9 kg/m ²	19	13,66
	35-39,9 kg/m ²	6	4,32
Residence	rural	28	20,14
	urban	111	79,86

Table 2. Anthropometric values in participating subjects

	Mean±SD	Median	Min	Max	CV
Weight [kg]	72,08 ± 13,6	69,00	49	117	18,8
High [m]	1,67 ± 0,05	1,67	1,54	1,86	3,43
BMI [kg/m ²]	25,9 ± 4,8	25,51	17	39,4	18,6

Table 3. Relationship between age, diseases and BMI of participants

Question	30-39		40-49		p	
	n	%	n	%		
Diseases	yes	36	42,86	34	61,82	0,028
	no	48	57,14	21	38,18	
BMI [kg/m ²]	17-18,4	4	4,76	0	0	0,002
	18,5-24,9	46	54,76	14	25,45	
	>24,9	34	40,47	41	74,54	

In terms of the place of residence, respondents living in the city exhibited a greater tendency to maintain normal body weight (n=52, 86.67%) than the women from rural areas (n=8, 13.33%). A similar tendency was observed with regard to the level of overweight and obesity: a BMI>24.9kg/m² index was noted in 74.67% of the women from urban areas. Despite the noticeable difference in the results, the statistical analysis did not show significant differences ($p=0.218$) (Table 4).

Table 4. Relationship between BMI and residence of participants

Residence	BMI <18,4 kg/m ²		18,5-24,9 kg/m ²		>24,9 kg/m ²		p
	n	%	n	%	n	%	
urban	3	75	52	86,67	56	74,67	0,218
rural	1	25	8	13,33	19	25,33	
N	4	100	60	100	75	100	

As in the case of the age, the body mass index was an important risk factor for the development of other diseases in the respondents ($p=0.002$) (Table 5). The most frequent diseases in the group of the surveyed women included cardiovascular diseases (n=26, 18.71%), skin diseases (n=12, 8.63%), and anaemia (n=13, 9.35%). In their investigations, Chen et al. [2015] and Asik et al. [2013] reported an increased risk of cardiovascular problems in Hashimoto's patients. With regard to the body mass index, anaemia (n=5, 8.33%) and skin diseases (n=5, 8.33%) were shown to be the most common health problems in the group of respondents with normal body

weight, whereas cardiovascular diseases (n=17, 22.67%), dyslipidaemias (n=7, 9.33%), and arthritis (n=7, 9.33%) were most prevalent in the BMI>24.9 group (Table 4). Given the frequent coexistence of anaemia in Hashimoto's thyroiditis patients, attention should be focused on a vitamin B₁₂ supply in the daily diet and its concentration in the organism should be monitored [19]. A significant correlation was found between the body weight and the development of some diseases. The respondents with excessive body weight were more susceptible to develop cardiovascular disease (p=0.01) than the other females (Table 5). Other authors have suggested an increased risk of additional diseases in Hashimoto's disease patients e.g. iron deficiency anaemia, pernicious anaemia [12], ischemic heart disease [13], cardiovascular disorders, atherosclerosis [14], idiopathic urticaria [20], thyroid cancer, colon cancer [21].

Table 5. Relationship between BMI and others diseases of participants

BMI	<18,4 kg/m ²		18,5-24,9 kg/m ²		>24,9 kg/m ²		p
	N=4		N=60		N=75		
Health problems	n	%N	n	%N	n	%N	
yes	2	50	20	33,33	48	63,16	0,002
no	2	50	40	66,67	27	35,53	
CVD	0	0	3	15,0	17	35,4	0,01
Dyslipidemia	0	0	2	10,0	7	14,6	0,322
PCOS	1	50	3	15,0	4	8,3	0,244
Skin disease	0	0	5	25,0	6	12,5	0,836
Typ I diabetes	0	0	1	5,0	1	2,1	0,958
Typ II diabetes	0	0	1	5,0	6	12,5	0,221
Celiac disease	1	50	2	10,0	1	2,1	0,121
Anemia	0	0	5	25,0	1	2,1	0,126
IBD	0	0	0	0,0	3	6,3	0,27
Cancers	0	0	2	10,0	1	2,1	0,697
Arthritis	0	0	2	10,0	7	14,6	0,322
Liver diseases	0	0	0	0,0	4	8,3	0,172
Infections	0	0	1	5,0	3	6,3	0,679
Allergic diseases	0	0	3	15,0	1	2,1	0,422
Insulin resistance	0	0	1	5,0	3	6,3	0,679
Asthma	0	0	2	10,0	1	2,1	0,957
Endometriosis	0	0	1	5,0	1	2,1	0,957

Exp.: CVD – cardiovascular disease, PCOS - Polycystic ovary syndrome, IBD - inflammatory bowel disease.

The most common symptoms in the respondents prior to the diagnosis of Hashimoto's thyroiditis included fatigue/weakness/drowsiness (n=122, 87.7%), difficulty in concentration/weak memory (n=88, 63.3%), increased body weight (n=85, 61.1%), mood swings/depression (n=82, 58.9%), skin lesions (n=80, 57.55%), and nervousness (n=80, 57.55%). A few respondents reported conception problems, migraines, palpitation, or joint pain. These results partially overlap with the symptoms noted by Carle et al. [22]. In terms of BMI, the respondents with a body mass index above 24.9 kg/m² indicated a body weight increase (n=61, 81.3%; p=0.001) and oedemas (n=35, 46.7%, p=0.002) as symptoms developing before the diagnosis of Hashimoto's disease (Table 6).

Almost half of the respondents (n=56, 40.29%) could not specify the length of the presence of these symptoms prior to the diagnosis of Hashimoto's thyroiditis. In turn, 12.9% (n=18), 14.4% (n=20%), 15.83% and 11.5% (n=16) of the patients claimed that the symptoms developed over 5 years, 3-4 years, 1-2 years, and several months before the diagnosis, respectively. Only 5% (n=7) of the patients noticed the symptoms a few weeks before the disease was diagnosed. This is a very low number, despite the increased interest in Hashimoto's disease in the recent years.

Hashimoto's disease was diagnosed in the surveyed women based on ultrasound examination (n=83, 59.7%), high TSH level (n=79, 56.8%), and/or an increased titre of antithyroid antibodies (n=78, 56.1%). A complementary examination that can confirm Hashimoto's thyroiditis should always include ultrasound examination revealing lymphocytic infiltrates and hypoechogenic thyroid structure [23,24]. Examination of the parameters of free fT3 and fT4 hormones as part of the diagnosis was declared by 18 women, and one respondent had a biopsy of the gland. The most numerous group of respondents were diagnosed with Hashimoto's disease 2 to 5 years before the survey (n=49, 35.3%). The lowest number of cases were detected over 10 years before (n=13, 9.35%), which may suggest more thorough diagnostics of the disease in the recent years.

Table 6. Relationship between BMI and others symptoms of participants

BMI	<18,4 kg/m ²		18,5-24,9 kg/m ²		>24,9 kg/m ²		p
	N=4		N=60		N=75		
Symptoms	n	% N	n	% N	n	% N	
fatigue/weakness/drowsiness	4	100,0	53	88,3	65	86,7	0,719
difficulty in concentration/weak memory	3	75,0	34	56,7	51	68,0	0,352
tiring quickly	2	50,0	35	58,3	39	52,0	0,749
abnormal menses	1	25,0	24	40,0	28	37,3	0,818
cold intolerance	2	50,0	35	58,3	37	49,3	0,576
discouragement	1	25,0	19	31,7	24	32,0	0,958
increased body weight	1	25,0	23	38,3	61	81,3	0
skin lesions	3	75,0	31	51,7	46	61,3	0,409
oedemas	1	25,0	11	18,3	35	46,7	0,002
fragile hair, hair loss	3	75,0	32	53,3	37	49,3	0,576
low heart rate	1	25,0	5	8,3	7	9,3	0,54
mood swings/depression	3	75,0	35	58,3	44	58,7	0,803
nervousness	3	75,0	36	60,0	41	54,7	0,637

The treatment of hypothyroidism, which often co-occurs with Hashimoto's disease, involves administration of levothyroxine, i.e. a synthetic analogue of the thyroid hormone. Only 12.9% of the respondents (n=18) did not take levothyroxine, which is administered in substitution treatment of hypothyroidism. The largest group of the respondents took a dose of levothyroxine below 100µg (n=77, 55%). Slightly fewer of them were administered levothyroxine doses exceeding 100µg (n=44, 31.66%). In their investigations, Kusy et al. [25] reported a similar percentage of patients that did not receive pharmacotherapy (12%). The other patients were not divided according to the dose of the drug. Considering the BMI of the respondents, there is a relationship between the body mass index and the administered levothyroxine dose. The women with excessive body weight received higher doses than those with BMI below 25 kg/m² (p=0.009) (Table 7). Noteworthy, some of the respondents altered the dose of the drug by themselves, depending on their well-being (n=22, 15.83%). Most of the patients (n=93, 66.91%) receiving treatment declared that they did take levothyroxine, whereas 7% (n=9) did not comply with the doctor's recommendations. A large group of the respondents (n=93, 66.91%) reported improvement upon the treatment, but 19.42% (n=27) did not notice any change. Winther et al. [26] confirmed the beneficial effect of levothyroxine, i.e. mitigation of the ailments reported by patients, in particular fatigue.

Table 7. Relationship between participants BMI and dose of levothyroxine

levothyroxine	<18,4 kg/m ² N=4		18,5-24,9 kg/m ² N=60		>24,9 kg/m ² N=75		p
	n	%N	n	%N	n	%N	
0- 49 µg	2	50	22	36,67	14	18,67	0,009
50-99 µg	2	50	27	45	28	37,33	
>= 100 µg	0	0	11	18,33	33	44	

It was observed that, regardless of the ingested levothyroxine dose, the largest group of respondents received vitamin D supplementation. Moreover, the group of patients treated with a levothyroxine dose below 100 µg had supplementation with vitamin C, group B vitamins, probiotics, and omega-3 acids more frequently than the other surveyed women (Table 8). The patients treated with a dose of 100 µg or higher did not use supplements in the diet, but the differences were not statistically significant.

Table 8. Relationship between dose of levothyroxine and supplements of diet

levothyroxine	<100 µg N=95		≥100 µg N=43		p
	n	%N	n	%N	
selenium	18	18,95	10	22,73	0,605
zinc	15	15,79	7	15,91	0,986
iron	12	12,63	7	15,91	0,601
potassium	1	1,05	1	2,27	0,574
magnesium	2	2,11	2	4,55	0,423
vitamin D	63	66,32	31	70,45	0,628
vitamin A	10	10,53	4	9,09	0,794
vitamin E	10	10,53	7	15,91	0,368
vitamin C	18	18,95	6	13,64	0,441
vitamin gr. B	19	20	7	15,91	0,565
Omega-3 fatty acids	16	16,84	6	13,64	0,63
multivitamin supplements	12	12,63	6	13,64	0,87
probiotics	17	17,89	6	13,64	0,53
Withania somnifera	1	1,05	1	2,27	0,574

Nearly half of the respondents did not receive additional recommendations (n=63, 45.5%) from the attending doctor for supplementation or changing their lifestyle. The other patients were recommended to apply vitamin D supplementation (n=57, 41%), introduce a diet (n=38, 27.3%), do physical activity (n=37, 26.6%), and avoid stress (n=35 25.2%). Selenium supplementation (n=23, 16.5%) and a sufficient length of sleep were recommended slightly less frequently (n=21, 15.1%). For normal function of the thyroid gland, emotional hygiene and an appropriate supply of some mineral components of thyroid hormones are crucial. Either following the recommendations or on their own accord, the largest group of respondents introduced vitamin D supplementation (n=94, 67.6%), did physical activity (n=55, 39.6%), eliminated dairy products (n=38, 27.34%), used selenium supplementation (n=38, 27.33%), and avoided gluten (n=34, 24.5%). The thyroid, i.e. an organ with the highest concentration of selenium, utilises selenoproteins in the metabolism of its hormones. Selenium is also an important antioxidant protecting against free radicals, which exacerbate the inflammatory process in Hashimoto's disease [27]. Probiotics were introduced into the diet by 16.54% of respondents (n=23). Vitamin C was supplemented by 17.2% of the respondents (n = 24), zinc by 27.34% (n=38), and omega 3 acids by 15.83% (n=22). No dietary supplements were taken by 20% of the respondents. The recommendations in Hashimoto's disease indicate supplementation with selenium, vitamin D, and omega 3 fatty acids [9].

One of the doctor's recommendations for the patients was to control their diet. A small group of the respondents (n=36, 25.9%) sought dietary advice relevant for management of their illness. Over 2/3 of the patients (n=105, 75.54%) did not follow the dietician's advice. Despite dietary consultations, only 19.4% (n=27) of the respondents followed individually adjusted dietary regimes, 9.3% (n=13) adjusted their menu to widely available diets (paleo type, Dr. Dąbrowska, Dr. Myers), 20% (n=28) used an elimination diet, and 51% (n=71) did not use any diet. Most of the respondents who followed the diet reported improvement in well-being and better examination results (n=63, 92.64%). The highest improvement was noted in the case of fatigue, weakness, and drowsiness (n=90, 64.7%), problems with concentration and memory (n=60, 43.1%), and body weight (n=59, 42.5%). Compliance with the diet therapy regimes posed a problem for 28.7% (n=21) of the respondents, whereas 21.9% (n=16) did not report such a problem.

Table 9. Relationship between participants BMI and physical activity

BMI	<18,4 kg/m ² N=4		18,5-24,9 kg/m ² N=60		>24,9 kg/m ² N=75		p
	n	%	n	%	n	%	
Physical activity	2	50	38	63,33	49	65,3	0,815
Physical inactivity	2	50	22	36,67	26	34,7	
Walking	2	100	10	26,3	19	38,8	0,07
Weight training	0	0	8	21,1	3	6,1	0,096
Jogging/biking	1	50	10	26,32	21	42,86	0,257
Swimming	0	0	2	5,26	5	10,2	0,639
Aerobics	0	0	3	7,9	6	12,2	0,713
Circuit training	0	0	2	5,3	2	4,1	0,92
Stretching	0	0	4	11,1	7	14,3	0,784

Most of the respondents declared having physical activity (n=89, 64%), with running/cycling (n=45, 50.6%) and walking/Nordic walking (n=31, 34.8%) as the dominant sport in this group. The BMI index had no impact on undertaking the decision to do physical activity (Table 9). The respondents with normal body weight were more likely to undertake strength exercises (13%) than those with BMI>24.9 kg/m² (3%), who preferred fitness exercise (Table 9).

4. Conclusion

1. In the group of female patients suffering from Hashimoto's disease, there is a need to control body weight given the incidence of increased BMI values and a higher risk of development of overweight and obesity with age. Patients with normal body weight respond to pharmacological treatment better and can be administered lower levothyroxine doses.
2. In Hashimoto's thyroiditis patients, attention should be paid to the prevention of cardiovascular diseases and application of an iron- and vitamin B₁₂-rich diet to counteract the increased prevalence of cardiovascular diseases and anaemia.
3. The time between the appearance of disturbing symptoms and the diagnosis of Hashimoto's disease ranged from 2 to over 5 years in most of the respondents. More than half of the respondents were diagnosed based on the level of TSH, elevated titres of antithyroid antibodies (anti-TPO, anti-TG), and ultrasound examination.
4. The lack of additional recommendations from the attending physician for changes in the lifestyle and nutrition is still a relatively common problem.
5. The diet produces positive effects and alleviates symptoms in Hashimoto's disease patients. Diet regimes and recommendations should be understandable and easy to implement, as patients often find it difficult to comply with them.
6. Irrespective of medical recommendations, the changes in the lifestyle and nutrition introduced by the respondents indicate their interest and willingness to learn about their disease. However, there are no guidelines for patients with chronic lymphocytic thyroiditis that would systematise the current knowledge of the general treatment of this disease.

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