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NUTRITIONAL APPROACH IN HASHIMOTO'S THYROIDITIS: A PEDIATRIC CASE STUDY

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This case study analyzes the effects of a personalized nutritional intervention on immune function, gut health, and symptomatology in a 10-year-old girl with Hashimoto's thyroiditis and celiac disease. The objective was to assess changes in biological markers and correct nutritional deficiencies.

Over the course of one year, at the Mitogenix Innovations Clinic in Targu-Mures, a diet excluding gluten, lactose, sugar, honey, and yeast was implemented. This dietary intervention was combined with functional foods and nutraceuticals to optimize metabolic status.

The results indicated increased levels of vitamin D3, zinc, and prealbumin, along with a reduction in anti-TPO, anti-transglutaminase IgA/IgG, and total IgE levels. The study highlights the role of medical nutrition in immune modulation and metabolic health, emphasizing the importance of continuous monitoring and personalized dietary strategies in managing pediatric autoimmune disorders.

Keywords: *Hashimoto's thyroiditis, autoimmunity, personalized nutritional intervention, pediatrics, clinical nutrition.*

ABORDARE NUTRIȚIONALĂ ÎN TIROIDITA HASHIMOTO: STUDIU DE CAZ PEDIATRIC

Acest studiu de caz analizează efectele unei intervenții nutriționale personalizate asupra funcției imune, sănătății intestinale și simptomatologiei unei fetițe de 10 ani cu tiroidită Hashimoto și boală celiacă. Scopul a fost evaluarea modificărilor markerilor biologici și corectarea deficiențelor nutriționale.

Timp de un an, în cadrul clinicii Mitogenix Innovations din Târgu-Mureș, s-a implementat o dietă fără gluten, lactoză, zahăr, miere și drojdie, combinată cu alimente funcționale și nutraceutice pentru optimizarea statusului metabolic.

Rezultatele au indicat creșterea nivelurilor vitaminei D3, zincului și prealbuminei, alături de reducerea anti-TPO, anti-transglutaminază IgA/IgG și IgE totale. Studiul evidențiază rolul nutriției medicale în modularea imunității și sănătatea metabolică, subliniind importanța monitorizării și strategiilor dietetice personalizate în managementul tulburărilor autoimune pediatrice.

Cuvinte-cheie**:** t*iroidita Hashimoto, autoimunitate, intervenție nutrițională personalizată, pediatrie, nutriție clinică.*

Introduction

Hashimoto's thyroiditis is the most common cause of thyroid disorders in children and adolescents. The histological features of the disease include a diffuse lymphocytic infiltrate in the thyroid gland and varying degrees of fibrosis with fatty infiltration. The clinical presentation and disease progression vary among patients. Most children are asymptomatic and exhibit normal thyroid function at the time of diagnosis. In symptomatic cases, the most common manifestations include goiter and growth retardation.

This condition is characterized by the presence of anti-thyroid peroxidase (TPO) and anti-thyroglobulin (TG) antibodies in the blood. A comprehensive diagnosis is based on the evaluation of thyroid hormone levels and thyroid ultrasound [1].

Autoimmune thyroiditis, also known as Hashimoto's thyroiditis, is the most common cause of acquired hypothyroidism in childhood, with a prevalence of 1% to 3%, peaking during adolescence. The condition predominantly affects females, with a female-to-male ratio ranging from 4:1 to 8:1 [2].

The etiology of autoimmune thyroiditis is multifactorial, involving a complex interplay between genetic and environmental factors that contribute to thyroid autoimmunity. It is estimated that genetic predisposition accounts for approximately 80% of the risk, while environmental triggers, such as excessive iodine intake, certain medications, infections, stress, and radiation exposure, constitute the remaining 20% [3, 4].

The genetic susceptibility to autoimmune thyroiditis is supported by epidemiological evidence, including familial aggregation, as 20-30% of cases have a positive family history of the disease [4].

It has been shown that the rising incidence of autoimmune diseases is closely linked to significant alterations in the gut microbiota, driven by multiple factors, including dietary changes and widespread antibiotic use. In this context, gut dysbiosis has been identified as a potential trigger for autoimmunity, as disruptions in the gut ecosystem may impair immune regulation and contribute to the development of autoimmune diseases [5].

An imbalance in the gut microbiota may promote autoimmunity through several mechanisms affecting the immune system, including modulation of immune responses, activation of antigen-presenting cells, and disruption of the Th17/Treg cell balance. Additionally, increased intestinal permeability, due to alterations in tight junction protein expression, may further amplify this process [6].

Changes in gut bacterial composition (dysbiosis), overgrowth of specific microbial species that enhance intestinal permeability, and activation of pro-inflammatory pathways are microbial factors that may negatively impact thyroid function [7,8,9].

The gut microbiota plays a crucial role in regulating the absorption of essential minerals for thyroid function, including iodine, selenium, zinc, and iron. These minerals are vital for thyroid health, and their imbalances have been linked to thyroid dysfunction [9].

Zinc deficiency affects thyroid function by disrupting the synthesis of TRH, TSH, T3, and T4, as well as impairing T3 interaction with nuclear receptors and its binding to DNA. A potential mechanism underlying zinc deficiency is impaired gastrointestinal absorption, which may compromise thyroid hormone metabolism and regulation [10].

Human studies have demonstrated that patients with hypothyroidism frequently exhibit low or deficient vitamin D levels compared to healthy individuals. An inverse correlation has been observed between 25-hydroxy-vitamin D concentrations and levels of anti-thyroid peroxidase (TPO) antibodies, anti-thyroglobulin (TG) antibodies, and TSH, while a positive association exists between 25-hydroxy-vitamin D and T3 levels. Additionally, reduced vitamin D levels in hypothyroidism may be a consequence of the disease rather than a direct cause [11, 12, 13, 14].

Aim of the study

The aim of this study was to evaluate the effects of nutritional intervention and functional foods on malnutrition correction, immune balance restoration, and improvement of digestive symptoms in a child diagnosed with celiac disease and Hashimoto's thyroiditis.

The study was conducted over a 12-month period (January 2024 – January 2025), during which the evolution of biochemical parameters, the response to a gluten-, lactose-, yeast-, and sugar-free diet, and the impact of the intervention on body weight, thyroid function, inflammation levels, overall health, and bowel function were systematically monitored.

Materials and methods

This case study involved a 10-year-old girl diagnosed with celiac disease and Hashimoto's thyroiditis, who presented in January 2024 for nutritional evaluation and intervention. The patient was part of the Mitogenix Innovations nutrition clinic in Targu Mures, where she received specialized dietary counseling and support tailored to her autoimmune conditions. A comprehensive nutritional history and medical assessment revealed persistent symptoms, including weight stagnation, lack of appetite, hard stools, recurrent abdominal pain, night tremors resembling chills, low energy levels, and weakened immunity.

Initial laboratory analyses indicated significant nutritional deficiencies, including low levels of prealbumin, vitamin D3, iron, and zinc, alongside intestinal dysbiosis.

A personalized nutritional intervention was implemented, emphasizing the exclusion of gluten, lactose, yeast, and sugar to promote gut recovery and restore nutritional balance. The diet was supplemented with nutraceuticals to correct deficiencies and support immune function.

Over a 12-month period (January 2024 – January 2025), the patient underwent regular monitoring through laboratory tests and clinical assessments to track the evolution of biochemical parameters, improvement in gastrointestinal symptoms, and weight gain.

The supplementation regimen during the intervention included zinc, vegan protein, digestive enzymes, vitamin D3, digestive teas, calming herbal extracts, probiotics, quercetin, colon support supplements, and other nutraceuticals aimed at reducing inflammation.

The patient's progress was monitored through laboratory analyses conducted at three different time points throughout the study period. These assessments revealed significant improvements across multiple parameters, including thyroid antibody negativity, increased serum prealbumin, elevated serum zinc and vitamin D3 levels, and overall weight gain.

These findings suggest that targeted nutritional intervention and supplementation played a key role in restoring metabolic balance, improving immune function, and supporting overall health.

Results and discussion

In our case study, we observed a significant increase in serum vitamin D3 levels, from 35.8 ng/mL to 57.5 ng/mL, following the dietary intervention and targeted supplementation. This improvement suggests an optimization of vitamin D status, likely influenced by supplementation, enhanced absorption, and improved overall nutritional balance.

Given the well-documented role of vitamin D3 in immune modulation, inflammation control, and thyroid function, this increase may have contributed to the reduction in autoimmune markers observed in the patient. These findings align with previous research indicating that vitamin D deficiency is common in autoimmune thyroid disorders and that restoring adequate levels may support immune homeostasis and metabolic health.

Further monitoring is required to assess the long-term stability of vitamin D levels and its ongoing impact on immune and thyroid function.

This increase in vitamin D3 levels aligns with previous studies demonstrating that vitamin D supplementation can reduce disease activity in Hashimoto's thyroiditis. Additionally, a randomized clinical trial reported a significant reduction in anti-thyroglobulin antibodies and TSH levels following three months of vitamin D administration [15].

The dietary intervention also resulted in a decrease in IgA anti-transglutaminase antibodies, suggesting a potential modification of the immune response associated with celiac disease. Specifically, IgA anti-transglutaminase antibody levels dropped from 55.3 U/mL to 3.9 U/mL, indicating a positive response to the gluten-free diet and overall immune modulation.

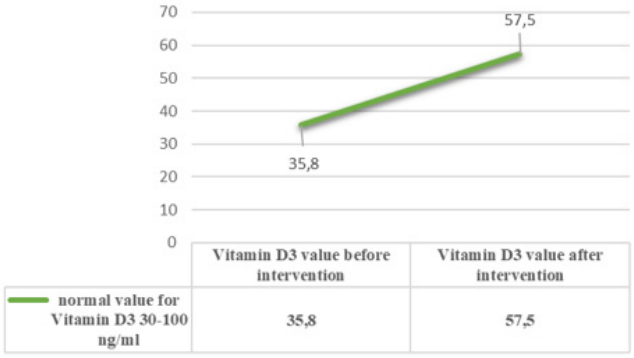

Figure 1. Evolution of serum vitamin D3 25-hydroxy during clinical nutritional intervention

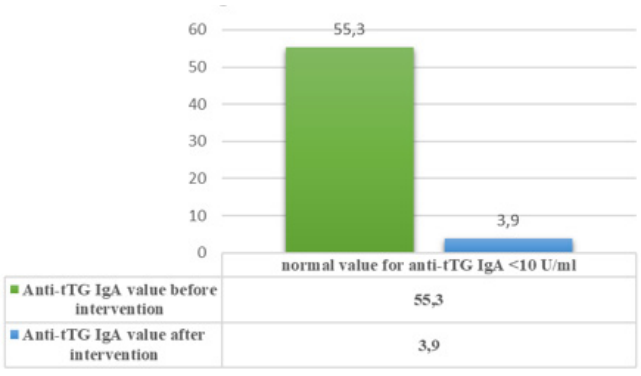

Figure 2. Evolution of IgA anti-transglutaminase antibodies during clinical nutritional intervention

Following the dietary intervention, a reduction in anti-tTG IgG antibody levels from 46.8 U/mL to 10.3 U/mL was observed, suggesting a decrease in inflammation and an improvement in immune tolerance. This decline may indicate a positive response to dietary modifications, particularly the elimination of gluten, which is known to play a key role in triggering autoimmune reactions in celiac disease.

A reduction in anti-tTG IgG antibodies is a positive indicator, suggesting a potential improvement in the autoimmune response. Studies have demonstrated that specific dietary interventions, such as a gluten-free diet, can influence antibody levels. In one study, after three months on a gluten-free diet, IgA-tTG and IgG-tTG antibody levels decreased in 19 out of 20 children with celiac disease [16].

Additionally, serum analysis revealed an increase in zinc levels from 0.84 mg/L to 1.58 mg/L, indicating a potential improvement in nutritional status and mineral metabolism. Given zinc's critical role in immune function, thyroid health, and gut integrity, this increase may have contributed to the overall clinical improvements observed in the patient.

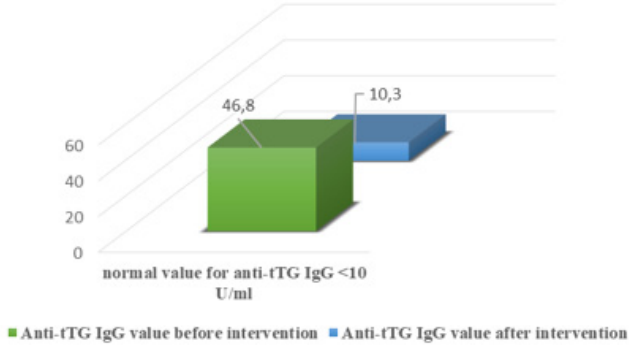

Figure 3. Evolution of IgG anti-transglutaminase antibodies during clinical nutritional intervention

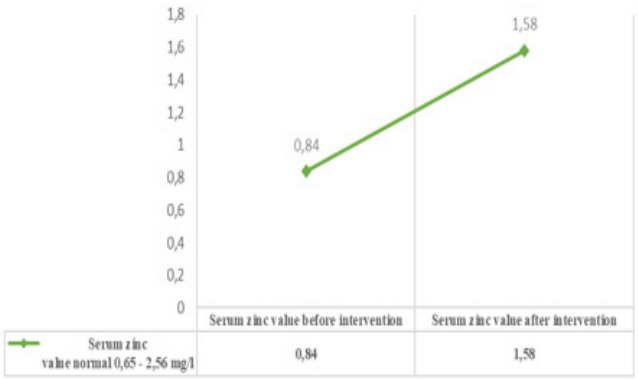

Figure 4. Evolution of serum zinc during clinical nutritional intervention

Patients with autoimmune diseases often exhibit zinc deficiency, as this trace element is essential for immune function and the regulation of inflammatory processes [17]. Restoring zinc levels through dietary intervention and supplementation may contribute to immune modulation and reduced inflammation, supporting overall metabolic balance.

Additionally, an increase in serum prealbumin levels was observed, indicating an improvement in protein status and liver function. This suggests an adequate nutritional intake, which is crucial for maintaining immune competence and overall health in individuals with autoimmune conditions. Following the dietary intervention, a decrease in anti-TPO antibody levels was observed, suggesting a reduction in autoimmune activity in the thyroid.

The decline in anti-TPO antibodies may indicate an improvement in thyroid inflammation, potentially reflecting a modulation of the immune response. Studies have shown that specific interventions, such as vitamin D supplementation, can help lower anti-TPO antibody levels, contributing to the management of autoimmune thyroiditis and supporting thyroid health [15].

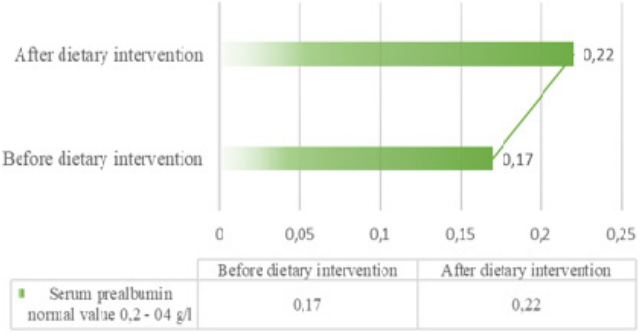

Figure 5. Evolution of serum prealbumin according to nutritional intervention

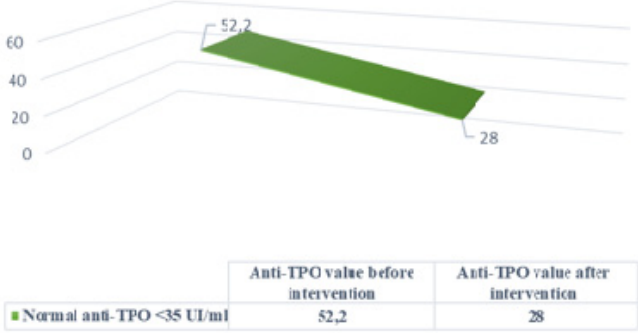

Figure 6. Evolution of anti-TPO antibodies according to nutritional intervention

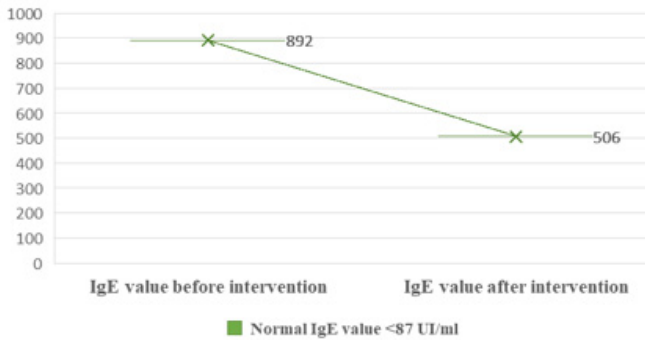

Figure 7. IgE evolution according to nutritional intervention

Following the dietary intervention, a significant reduction in IgE levels was observed, decreasing from 892 IU/mL to 506 IU/mL. This decline suggests an improvement in the allergic response and a reduction in systemic inflammation, indicating a positive modulation of immune function. Lower IgE levels may reflect decreased hypersensitivity reactions, which are commonly associated with gut permeability issues and immune dysregulation in autoimmune conditions.

These variations suggest that the tailored nutritional intervention, including the implemented treatment regimen, had a positive impact on homeostasis and nutritional status. This intervention contributed to the optimization of serum zinc, vitamin D3, and serum prealbumin levels, as well as to the reduction of inflammatory and autoimmune markers, supporting immune regulation and metabolic balance.

Table 1. Recommended supplements and functional foods in clinical nutrition intervention

Dietary supplement	Dose administered	Frequency of administration	Administration period
EGG albumin	1 cup	Every 2 days	2 months
Lauricidin powder	1 teaspoon per day dissolved in water	Daily	2 months
Rubia cardifolia tea	1 teaspoon per 300 ml of water	Daily	2 months
Enzymatic bioconcentrate from fruits, vegetables, and seeds	10 ml in the morning or evening	Daily	2 months
Chewable digestive enzymes for children	1 capsule at noon and 1 capsule in the evening	Daily	2 months
Zinc with black elderberry	3 ml per day	Daily	2 months
Parasites Cleanse	1 capsule in the morning and 1 capsule in the evening	For 21 days with a 10-day break, then repeat	21 days
Vitamin D3 with cofactor	1 capsule per day	Daily	2 months
Hydrolyzed Vegan Protein	30-40 g per day	Daily	2 months
Digestive enzymes	1 capsule in the morning	Daily	2 months
Formula with licorice root and lion's mane	1 capsule every 2 days	Every 2 days	2 months
Turmeric tea	1 cup per day	Daily	1 months

This integrated approach incorporated functional foods, targeted supplements, specific dietary adjustments, and continuous monitoring, contributing to immune system enhancement and systemic inflammation reduction in the evaluated pediatric patient.

Conclusion

During our one-year follow-up study of this pediatric case, conducted at the certified nutrition clinic of Mitogenix Innovations in Târgu-Mureș, we observed the critical role of medical nutrition therapy in supporting optimal growth, immune function, and metabolic balance. A structured, evidence-based dietary intervention, tailored to the patient's individual needs, demonstrated a significant impact on clinical outcomes, reinforcing the importance of personalized nutritional strategies in pediatric autoimmune disease management.

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