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Prevalence of Celiac Disease in Patients of Thyroid Disorder in a Tertiary Care Centre in North India

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Abstract

Introduction: Coeliac disease (CD) is a chronic immune-mediated disorder triggered by gluten ingestion in genetically predisposed individuals, causing small intestinal damage and nutrient malabsorption. It manifests with both gastrointestinal and extraintestinal symptoms and may be asymptomatic. Thyroid diseases, especially autoimmune thyroid disorders like Hashimoto's thyroiditis and Graves' disease, share genetic and immunological pathways with CD. Studies show a higher prevalence of CD among patients with thyroid disorders, necessitating routine screening. Early diagnosis and dietary intervention can improve clinical outcomes. This thesis explores the association between CD and thyroid diseases, underlying mechanisms, and the impact of early detection and management strategies.

Material & Methods: This cross-sectional study at G.S.V.M. Medical College, Kanpur (Feb 2024–Feb 2025) included 69 randomly selected adult patients with thyroid disorders. Data collection involved structured interviews, medical records, biochemical tests (CBC, LFT, KFT, thyroid profile, anti-TPO, HbA1c, anti-tTG/EMA), and UGI endoscopy and biopsy as needed. Ethical approval was obtained, and informed consent secured. Statistical analysis used SPSS v23 with Chi-square tests, ANOVA, correlation, and a significance level of $p<0.05$.

Results: In this cross-sectional study of 69 thyroid disorder patients (81.2% female, mean age 38.41 years), hypothyroidism was most prevalent (82.6%). Screening for celiac disease using IgA anti-tTG and anti-EMA antibodies showed a 1.4% seroprevalence, but no biopsy-confirmed cases. No significant associations were found between age, gender, hypertension, thyroid markers, and celiac disease markers. The findings suggest that routine celiac screening in thyroid disorder patients may not be necessary without gastrointestinal symptoms or additional risk factors.

Conclusion: This study found no biopsy-confirmed cases of celiac disease among 69 North Indian thyroid disorder patients, despite a 1.4% seroprevalence. Routine screening for celiac disease in thyroid patients is not warranted without specific symptoms or risk factors. A selective, symptom-driven approach is recommended. Larger multi-centric studies and genetic profiling are needed to better understand regional associations and refine screening strategies.

Keywords: Hypothyroidism, Hyperthyroidism, Autoimmune Thyroid Disorder, Celiac Disease, TSH

Introduction

Coeliac disease (CD), also known as coeliac sprue, is a chronic, immune-mediated enteropathy of the small intestine characterized by lifelong intolerance to dietary gluten. It results in mucosal injury of the proximal small intestine among genetically predisposed individuals. The pathogenesis of CD is governed by a complex interplay of genetic, immunological, and environmental factors. Notably, individuals with CD frequently possess specific genetic markers—HLA-DQ2 or HLA-DQ8—which confer susceptibility to an aberrant immune response to gluten. Gluten, a composite of proteins found in wheat, barley, and rye, acts as a binding agent that imparts elasticity to dough and structural integrity to baked goods. Following gluten ingestion, the immune system erroneously identifies gluten peptides as pathogenic. Tissue transglutaminase (tTG), an intestinal enzyme, modifies gluten peptides, enhancing their immunogenicity and promoting recognition by immune cells. This, in turn, activates T-cells within the small intestine, initiating a robust inflammatory cascade that culminates in mucosal damage. Chronic inflammation leads to villous atrophy, characterized by the flattening of villi—microscopic structures critical for nutrient absorption—resulting in significant impairment of intestinal absorptive function.

The inflammatory process also induces crypt hyperplasia, compounding the structural damage to the mucosa. These histological alterations lead to impaired digestion, diminished absorption of macronutrients and micronutrients, and an increase in the secretion of water and solutes. Importantly, these pathological changes can reverse with strict adherence to a gluten-free diet.

Clinically, coeliac disease exhibits a broad spectrum of manifestations[1]. Classical gastrointestinal symptoms include diarrhea, steatorrhea, abdominal pain, and malabsorption, while extraintestinal symptoms such as anemia, osteoporosis, neurological disturbances, and dermatitis herpetiformis are increasingly recognized. Nonclassical presentations, such as isolated anemia, neurological manifestations, hypoproteinemia, hypocalcemia, and elevated liver enzymes, are also common. It is now acknowledged that symptomatic cases constitute only the visible portion of the “celiac iceberg,” with many individuals remaining asymptomatic or presenting with atypical symptoms, thus remaining undiagnosed.

Concurrently, thyroid diseases—both autoimmune and non-autoimmune—represent some of the most prevalent endocrine disorders globally, affecting millions of individuals. Autoimmune thyroid diseases (ATDs), particularly Hashimoto’s thyroiditis (HT) and Graves’ disease (GD), arise from immune-mediated mechanisms resulting in hypothyroidism and hyperthyroidism, respectively. HT is typified by the presence of antibodies against thyroid peroxidase (TPO) and thyroglobulin (Tg), leading to progressive thyroid dysfunction. In contrast, GD is mediated by thyrotropin receptor antibodies (TRAbs) that stimulate unregulated thyroid hormone production. Besides ATDs, non-autoimmune thyroid

disorders, such as iodine deficiency-induced hypothyroidism, multinodular goiter, and thyroid adenomas, also contribute significantly to the global burden of thyroid dysfunction. Both autoimmune and non-autoimmune thyroid disorders are influenced by genetic predispositions and modulated by environmental factors, including infections, psychological stress, and dietary deficiencies.

A substantial body of epidemiological and clinical evidence supports a strong association between coeliac disease and thyroid disorders, particularly ATDs. Shared genetic backgrounds, including HLA class II gene associations, and common immunopathogenic mechanisms are thought to underpin this relationship. Moreover, increased intestinal permeability in CD may facilitate the translocation of antigens across the gut barrier, thereby triggering systemic autoimmune responses that promote thyroid autoimmunity. The chronic inflammatory environment and dysregulated immune surveillance inherent to CD further amplify the risk of thyroid dysfunction. Conversely, untreated thyroid disorders—whether autoimmune or non-autoimmune—may impair gut permeability and immune tolerance, potentially precipitating the onset or exacerbation of latent or subclinical coeliac disease. Additionally, nutrient deficiencies common in CD, particularly selenium, iodine, and vitamin D—micronutrients essential for optimal thyroid function—may further predispose affected individuals to thyroid dysfunction.

The prevalence of coeliac disease among individuals with thyroid disorders is substantially elevated relative to the general population. Studies estimate that 2–10% of patients with autoimmune thyroid diseases are concurrently diagnosed with CD, compared to an approximate global prevalence of 1%. Although data on CD prevalence among patients with non-autoimmune thyroid disorders are comparatively limited, emerging evidence suggests that thyroid dysfunction itself may induce gastrointestinal abnormalities, thereby contributing to CD pathogenesis. This heightened prevalence necessitates the consideration of routine screening for CD in individuals with thyroid disorders, particularly those exhibiting unexplained gastrointestinal symptoms, iron-deficiency anemia, osteoporosis, or persistent thyroid dysfunction unresponsive to conventional therapy. Early diagnosis and initiation of a strict gluten-free diet in patients with concurrent CD and thyroid disease not only alleviate gastrointestinal symptoms but may also improve thyroid function and reduce the risk of long-term complications.

Despite robust evidence establishing the association between these conditions, the precise mechanisms underlying their coexistence remain incompletely defined. Proposed explanations include molecular mimicry, shared genetic susceptibility, and the influence of environmental triggers that together contribute to disease development. Furthermore, alterations in gut microbiota, dietary factors, and systemic immune responses are increasingly recognized as potential modulators of disease progression. Some researchers propose that prolonged gluten-induced inflammation in genetically susceptible individuals fosters systemic immune dysregulation, thereby impairing thyroid function. Conversely, it has been suggested that thyroid dysfunction itself, particularly if untreated, may adversely affect intestinal permeability, thereby predisposing individuals to the development of coeliac disease.

Screening for coeliac disease typically involves serological detection of anti-endomysial (EMA) and anti-tissue transglutaminase (tTG) immunoglobulin A (IgA) antibodies, both of which are highly specific for the

disease. While serological positivity is suggestive, definitive diagnosis requires histopathological confirmation via small bowel endoscopy and duodenal biopsy, with characteristic findings including villous atrophy and crypt hyperplasia. Although serological tests are not independently conclusive, they serve as an essential tool for the screening of large populations and the identification of asymptomatic or sub-clinically affected individuals.

This study aims to comprehensively explore the prevalence of coeliac disease among patients with thyroid disorders, delineating the underlying immunopathogenic mechanisms, genetic predispositions, and clinical implications of this association. Through a critical analysis of existing literature, clinical studies, and epidemiological data, the research seeks to elucidate the complex interplay between autoimmune and non-autoimmune thyroid disorders and coeliac disease. Furthermore, the study will evaluate the impact of early screening and dietary intervention on clinical outcomes, underscoring the importance of a multidisciplinary and integrated approach to managing these coexisting conditions. Additionally, the study will address the broader healthcare policy implications, proposing evidence-based recommendations for screening and management tailored to individuals with concurrent thyroid and coeliac disease. Ultimately, this research aspires to contribute meaningfully to the expanding body of knowledge on autoimmune disorders and inform the development of clinical guidelines aimed at improving early diagnosis, management strategies, and long-term patient outcomes.

Material & Methods

The investigation was conducted at our hospital with patients recruited from both the Outpatient Department (OPD) and hospitalized wards. This cross-sectional study was conducted over a 12-month period from February 2024 to February 2025.

A total of 69 patients were included, selected through a random sampling method to ensure representativeness. Eligibility criteria included adults aged 18 years and above, of either sex, with a known diagnosis of thyroid disorders (hypothyroidism or hyperthyroidism), whether newly diagnosed or under treatment. Exclusion criteria comprised pregnant and lactating females, patients who had undergone thyroid surgery, and those with a history of small bowel resection.

Patients were assigned random numbers and selected accordingly. Informed consent was obtained, and ethical approval was secured from the Institutional Ethics Committee. Confidentiality was rigorously maintained, with anonymized data handling and restricted access protocols.

The sample size was calculated based on an estimated prevalence of celiac disease in autoimmune thyroid disease (AITD) in India (3.6%), using a 95% confidence level and 5% margin of error, resulting in a required sample size of approximately 54, which was exceeded to 69 for robustness.

Data collection involved structured patient interviews for demographic information, medical record reviews, and biochemical analyses. Blood samples were taken for Complete Blood Count (CBC), Liver Function Test (LFT), Kidney Function Test (KFT), Serum Electrolytes, Thyroid Profile (TSH, T3, T4), Anti-TPO antibodies, and HbA1c. Further, selected patients were tested for IgA anti-tTG and IgA anti-EMA. Upper gastrointestinal (UGI) endoscopy and biopsy was performed as needed to confirm diagnoses.

A pilot study involving six patients was conducted to evaluate feasibility, validate tools, and refine study

procedures. Standardized protocols and rigorous staff training ensured consistency and minimized variability.

Data were statistically analyzed using IBM SPSS v23. Descriptive statistics summarized the data. Inferential tests included Chi-square tests for categorical variables, arithmetic mean and standard deviation for continuous data, confidence interval estimation, Analysis of Variance (ANOVA) for group comparisons, and Pearson's correlation coefficient for examining relationships between continuous variables. A two-sided p-value of less than 0.05 was considered statistically significant.

Results

The study evaluated the prevalence of celiac disease (CD) among patients with thyroid disorders at a tertiary care center in North India over a period of 12 months, comprising 69 subjects. The mean age of the cohort was 38.41 ± 12.80 years, with the age group of 31–40 years contributing the largest proportion (31.9%) of cases, followed by 21–30 years (21.7%) and 41–50 years (21.7%). Participants aged ≤20 years and >60 years formed the smallest proportions, accounting for 8.7% and 2.9%, respectively.

A pronounced female predominance was observed, with 81.2% females and only 18.8% males. In terms of thyroid disorder type, hypothyroidism emerged as the most prevalent condition (82.6%), followed by hyperthyroidism (13.0%) and subclinical hypothyroidism (4.3%). Hypertension, as a comorbidity, was infrequent among the study population, present in only 5.8% of participants.

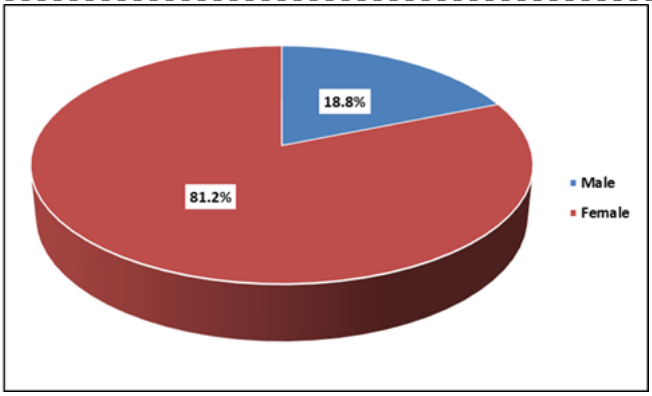

Figure 1: Distribution of Cases of Thyroid Disorder according to Gender

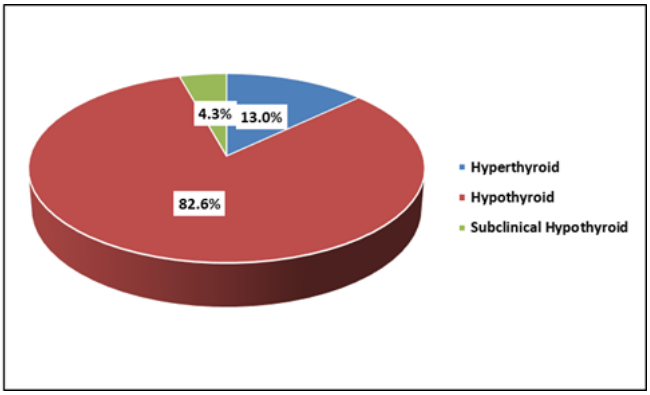

Figure 2: Distribution of cases according to type of Thyroid Disorder

The evaluation of autoimmune thyroid disorder (AITD) through Anti-TPO antibody positivity revealed that 60.9% of the cases were positive, while 39.1% were negative. The mean Anti-TPO antibody titer among participants was 195.08 ± 298.55 IU/mL, suggesting a significant variability in antibody levels.

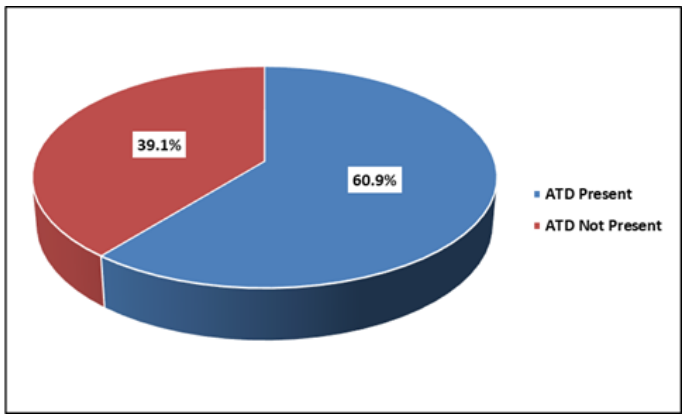

Figure 3: Distribution of Cases according to Anti-TPO Antibody Positivity

Screening for celiac disease was carried out using IgA anti-tissue transglutaminase (anti-tTG) antibodies and IgA anti-endomysial antibodies (anti-EMA). Notably, all 69 patients demonstrated normal IgA anti-tTG levels (≤20 AU/mL), with a mean of 3.63 ± 2.90 AU/mL. Correspondingly, IgA anti-EMA levels were within normal limits for 98.6% of participants (mean value of 10.35 ± 12.74 AU/mL). Only a single patient exhibited borderline positive anti-EMA titers, corresponding to a seroprevalence rate of 1.4% in the overall population and 2.4% among the AITD subgroup. However, no biopsy-confirmed cases of celiac disease were identified upon subsequent evaluation, even among seropositive individuals.

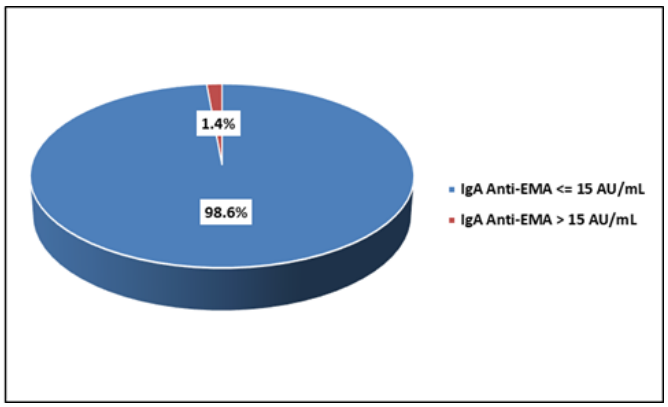

Figure 4: Antibody Prevalence of Celiac Disease

Further analysis stratified patients according to thyroid disorder subtype and examined their associations with demographic characteristics. Within the AITD subgroup, hypothyroidism was overwhelmingly predominant (87.1%), followed by hyperthyroidism (9.7%) and subclinical hypothyroidism (3.2%). No significant association was observed between age, gender, or hypertension status and the presence of thyroid disorders or autoimmune thyroid disease.

When considering the seroprevalence of CD, no significant associations with age, gender, or hypertension status were found. Interestingly, the one borderline seropositive case for anti-EMA occurred in a female patient aged between 31–40 years, who was positive for Anti-TPO antibodies but asymptomatic for gastrointestinal manifestations.

The correlations between thyroid markers (TSH, T3, T4) and celiac disease markers (IgA anti-tTG, IgA anti-EMA) were also analyzed. No statistically significant correlations were established between thyroid function parameters and celiac serology markers. Additionally, patients' biochemical profiles (CBC, LFT, KFT, SE) did not show any aberrations suggestive of underlying malabsorption or chronic inflammatory states typically associated with celiac disease.

Thus, despite a mild serological signal, the study did not document any biopsy-confirmed cases of celiac disease among patients with thyroid disorders. These findings contrast with earlier studies, which reported a CD prevalence ranging from 3% to 5% among AITD cohorts. Consequently, the study suggests that routine screening for CD in all thyroid disorder patients may not be justified within similar demographic settings. Instead, a more targeted screening approach, focusing on patients with gastrointestinal symptoms or additional risk factors, is recommended. The authors emphasize the necessity for larger multicentric studies incorporating complete diagnostic evaluation and genetic profiling to further elucidate the association between celiac disease and thyroid disorders in diverse Indian populations.

Discussion

This study aimed to investigate the prevalence of celiac disease (CD) among patients with thyroid disorders in a North Indian cohort. The demographic and clinical profiles observed were largely consistent with existing epidemiological trends[2,3], with a mean age of 38.41 ± 12.80 years and a significant female predominance (81.2%). Hypothyroidism was the most

common thyroid disorder, accounting for 82.6% of cases, aligning with both local and international data.

Screening for CD in the cohort revealed minimal serological positivity with only one individual demonstrating a borderline positive IgA anti-EMA antibody level. The patient who screened positive was advised upper gastrointestinal endoscopy and duodenal biopsy to confirm the diagnosis of CD, but that patient did not consent to the procedure. The absence of confirmed CD cases suggests a low prevalence of clinically significant celiac disease among thyroid disorder patients in this population, contrasting with higher prevalence rates (3–5%) reported in European studies[4–6].

Several factors may potentially explain these findings. First, the incomplete diagnostic algorithm, particularly the inability to perform duodenal biopsies in seropositive patients, may have led to an underestimation of true CD prevalence. Furthermore, autoimmune diseases, including autoimmune thyroid disorders (AITD), can induce nonspecific antibody production due to polyclonal B-cell activation, raising the risk of false-positive serological results[7,8]. These phenomena have been documented in prior studies and highlight the necessity of comprehensive diagnostic pathways integrating both serological and histological evaluations.

Additionally, population specific genetic and environmental influences should be considered, particularly the prevalence of HLA-DQ2 and DQ8 haplotypes. Many of the earlier studies demonstrating a higher prevalence of CD in thyroid patients were conducted in European populations, where these genetic markers are more common. Our North Indian cohort may have a lower frequency of these predisposing alleles, which would, in turn, result in a lower baseline prevalence of CD. Environmental influences, such as differences in dietary gluten exposure and early-life nutritional practices, may further modulate the risk of developing CD. Therefore, the apparent discrepancy in CD prevalence between this study and Western literature may reflect epidemiological differences rather than methodological deficiencies[9,10].

The clinical characterization of thyroid disorders in this cohort provided further insights. Anti-TPO antibody positivity, observed in 60.9% of cases, reaffirmed the autoimmune nature of thyroid disorders in this population. Gender distribution patterns and the predominance of hypothyroidism mirrored established epidemiological findings. Importantly, no significant associations were identified between thyroid disorder subtypes and demographic variables such as age, gender, or hypertension, suggesting a multifactorial etiology not solely dictated by demographic factors.

Correlative analyses between thyroid function markers (TSH, T3, T4), anti-TPO antibody titers, and CD serological markers (IgA anti-tTG, IgA anti-EMA) failed to demonstrate statistically significant relationships. This absence of meaningful correlations suggests that, within this cohort, the immunological mechanisms underlying thyroid dysfunction and celiac disease operate independently or interact too subtly to be detected through standard serological testing.

From a clinical standpoint, the findings advocate against routine universal screening for celiac disease in thyroid disorder patients in similar populations. Instead, a selective approach—focusing on individuals presenting with gastrointestinal symptoms, nutritional deficiencies, or a family history suggestive of CD—is recommended[11,12]. This targeted strategy would optimize resource utilization while minimizing unnecessary diagnostic procedures and the potential psychological burden of false-positive findings[13].

The discussion also acknowledged that undiagnosed subclinical CD could still have implications for thyroid management, particularly concerning levothyroxine absorption. Although this study did not encounter confirmed CD cases, previous literature has indicated that a gluten-free diet can enhance thyroid hormone absorption in CD patients, thereby reducing medication dosages[14]. This underscores the importance of maintaining clinical vigilance and considering further investigation in selected high-risk patients despite the overall low prevalence.

Finally, the study emphasized the importance of robust diagnostic pathways and complete follow-up in seropositive cases. Future research should incorporate larger, multicentric cohorts, include genetic profiling, and ensure histological confirmation of CD to yield more definitive conclusions regarding the association between thyroid disorders and celiac disease in the Indian population.

In conclusion, while an immunological basis for a thyroid-CD association is plausible, the clinical manifestation appears limited within this North Indian cohort. Individualized patient assessment, rather than blanket screening policies, emerges as the rational approach based on the findings.

Conclusion

This study, conducted over 12 months at GSVM Medical College, Kanpur, evaluated the prevalence of celiac disease (CD) in patients with thyroid disorders. A total of 69 participants were enrolled, predominantly females (81.2%) with a mean age of 38.41 ± 12.80 years. Hypothyroidism was the most common thyroid disorder (82.6%), and 60.9% of patients were positive for anti-thyroid peroxidase (anti-TPO) antibodies, confirming an autoimmune etiology in a significant proportion.

Serological screening for celiac disease, using IgA anti-tTG and IgA anti-EMA antibodies, revealed a marginally elevated anti-EMA level in one patient (1.4% seroprevalence). However, no biopsy-confirmed cases of CD were detected, as the sole seropositive patient declined further diagnostic endoscopy. Consequently, the observed prevalence of biopsy-confirmed CD in this cohort was 0%, contrasting with prior studies from Western populations that reported CD prevalence rates between 3% and 5% among patients with autoimmune thyroid diseases (AITD).

The study's findings emphasize that the anticipated overlap between thyroid disorders and celiac disease, suggested by immunological associations, does not translate into a significant clinical burden within the studied North Indian population. Thus, routine screening for CD among patients with thyroid disorders is not supported. Instead, a selective screening strategy, focusing on individuals presenting with gastrointestinal symptoms, nutritional deficiencies, or relevant family history is recommended. Such an approach would optimize healthcare resource utilization while minimizing unnecessary investigations and associated patient anxiety.

Importantly, the study highlights the necessity for comprehensive diagnostic protocols when screening for CD, including serological testing followed by confirmatory biopsy where appropriate. The incomplete diagnostic pathway due to patient refusal represents a limitation and underscores the importance of full evaluation to avoid underestimating disease prevalence.

Future research should prioritize larger, multicentric studies to enhance statistical power and generalizability. Incorporating genetic profiling, particularly of HLA-DQ2 and HLA-DQ8 haplotypes, would offer deeper insights into the regional epidemiology of CD. Prospective

studies could also clarify the temporal relationship between thyroid autoimmunity and the development of CD and evaluate whether a gluten-free diet improves thyroid hormone absorption and management outcomes in co-affected individuals.

In conclusion, while there is a plausible immunological basis for an association between thyroid disorders and celiac disease, the clinical significance of this relationship appears limited in this North Indian cohort. Screening practices should be individualized, and further robust research is essential to refine clinical guidelines tailored to regional epidemiology and healthcare settings.

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