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Vitamin B12 and Vitamin D3 Deficiency In Patient's With Irritable Bowel Syndrome

[1]Dr. Abhijit Budhkar, [2]Dr. Khushboo Jha
[1]MBBS, DNB (General Surgery), FMAS, FIAGES, FCRS, MUHS (Colorectal), Assistant Professor,
[2]MBBS, Junior Resident,
Department of General Surgery, Dr. DY Patil School of Medicine, Navi Mumbai

***Corresponding Author:**
Dr. Khushboo Jha
MBBS, Junior Resident, Department of General Surgery, Dr. DY Patil School of Medicine, Navi Mumbai

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Abstract

Background: Irritable Bowel Syndrome (IBS) is a functional gastrointestinal disorder characterized by abdominal pain, altered bowel habits, and impaired quality of life. Emerging evidence suggests that micronutrient deficiencies- particularly Vitamin D3 and Vitamin B12—may contribute to heightened symptom severity due to their roles in neuromuscular regulation, immune modulation, and gut-brain axis functioning. This study aimed to assess the prevalence of Vitamin D3 and Vitamin B12 deficiencies in IBS patients and to evaluate the symptomatic improvement following targeted supplementation.

Objectives: To determine deficiency rates of Vitamin D3 and Vitamin B12 among IBS patients and to assess changes in symptom severity after correcting these deficiencies.

Methods: A total of 114 patients diagnosed with IBS based on Rome IV criteria were evaluated for baseline serum Vitamin D3 and Vitamin B12 levels. Patients with confirmed deficiencies received standardized supplementation for 12 weeks. Symptom severity was assessed pre- and post-intervention using the IBS Severity Scoring System (IBS-SSS) and Visual Analog Scale (VAS). Data were analyzed using paired statistical methods.

Results: Vitamin D3 deficiency was present in 76% of patients and Vitamin B12 deficiency in 42%. Following supplementation, mean IBS-SSS scores significantly improved from 278 ± 54 to 162 ± 47, while VAS symptom scores decreased by 37%. Patients with severe baseline deficiencies showed the greatest improvement.

Conclusion: Vitamin D3 and Vitamin B12 deficiencies are highly prevalent among IBS patients and contribute to greater symptom burden. Correction of these deficiencies results in significant symptomatic improvement, highlighting the need for routine micronutrient assessment in IBS management.

Keywords: Vitamin D3, Vitamin B12, Irritable Bowel Syndrome, Micronutrient Deficiency, Symptom Improvement

Introduction

Irritable bowel syndrome (IBS) is a chronic functional gastrointestinal disorder characterized by recurrent abdominal pain, altered bowel habits, bloating, and a significant reduction in quality of life, affecting an estimated 10–15% of the global population [1]. Although the exact pathophysiology of IBS remains unclear, accumulating evidence indicates that a complex interplay of visceral hypersensitivity, gut dysbiosis, altered intestinal motility, immune activation, and micronutrient deficiencies may contribute to its onset and persistence [2]. In recent years, deficiencies of **vitamin D3** and **vitamin B12** have gained considerable attention for their potential role in modulating symptoms in patients with IBS. Vitamin D3 is well known for its actions in calcium homeostasis, but its roles extend to immune regulation, modulation of intestinal barrier integrity, and anti-inflammatory effects, all of which are

relevant to IBS pathology [3]. Several studies have demonstrated that low serum vitamin D levels are significantly more prevalent among individuals diagnosed with IBS compared with healthy controls, suggesting that deficiency may predispose affected individuals to heightened sensitivity, increased intestinal permeability, and dysregulated immune responses [4].

Moreover, vitamin D supplementation has been associated with improvement in abdominal pain, bloating, and overall symptom severity scores, most likely due to its role in modulating the gut–brain axis and reducing low-grade inflammation that often accompanies IBS [5]. Similarly, **vitamin B12,** an essential water-soluble micronutrient involved in DNA synthesis, mitochondrial function, and neuronal health, has also been linked to gastrointestinal functioning. Patients with IBS—particularly those with IBS-D and IBS-M subtypes—may present with malabsorption resulting from dysbiosis or rapid intestinal transit, contributing to reduced vitamin B12 levels [6]. Deficiency of vitamin B12 can cause fatigue, neuropathic pain, and cognitive disturbances, which may further amplify the visceral sensitivity and psychological distress commonly observed in IBS patients [7].

IBS symptoms are strongly influenced by alterations in the enteric nervous system and autonomic regulation, insufficient vitamin B12 may aggravate nerve dysfunction and perpetuate abnormal gut motility patterns, worsening symptom severity [8]. Emerging clinical data also suggest that restoring normal vitamin B12 levels through supplementation can lead to meaningful improvements in energy levels, gastrointestinal comfort, and patient-reported symptom relief, particularly in individuals with concurrent anemia or neuropathic features [9]. The coexistence of vitamin D3 and B12 deficiencies in IBS patients is not uncommon, as both nutrients are influenced by dietary patterns, gastrointestinal absorption, and gut microbiota composition. Together, these deficiencies may create a synergistic negative impact by contributing to immune dysregulation, impaired neuromuscular signaling, and heightened pain perception, all of which are core components of IBS pathogenesis [10]. Supplementation of both vitamins therefore presents a biologically plausible and therapeutically relevant strategy for alleviating IBS symptoms by targeting multiple pathways simultaneously. Vitamin D may reduce mucosal inflammation, strengthen epithelial barrier function, and regulate microbiome composition, while vitamin B12 may enhance neuromuscular coordination, improve nerve conduction, and reduce fatigue-related symptom exacerbation. As IBS is a condition with no definitive cure and highly variable response to conventional therapies, including dietary modification, antispasmodics, and psychological interventions, identifying correctable factors such as micronutrient deficiencies holds substantial clinical value . Given the growing evidence supporting the role of vitamins in maintaining gut–brain homeostasis, it is reasonable to hypothesize that **IBS patients with vitamin D3 and B12 deficiencies may experience significant symptomatic improvement upon targeted supplementation**, making this an important area for further clinical research. Understanding the interplay between micronutrient status and IBS symptomatology is therefore essential for developing comprehensive, patient-centered management strategies.

Methodology

Study Design

The present study was designed as a prospective interventional study.

Study Setting

The study was conducted in the Department of General Surgery of a tertiary care hospital, which catered to a diverse patient population with varied gastrointestinal conditions.

Study Duration

The study was conducted over a period of eight months.

Participants

Inclusion Criteria

1. Adults aged 18–60 years diagnosed with IBS according to the *Rome IV* criteria
2. Laboratory-confirmed Vitamin D3 deficiency (<30 ng/mL)
3. Laboratory-confirmed Vitamin B12 deficiency (<200 pg/mL)
4. Participants willing to provide written informed consent

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5. Individuals able to comply with supplementation and follow-up schedule

Exclusion Criteria

1. Diagnosed cases of inflammatory bowel disease, celiac disease, or malignant conditions
2. Individuals who had taken Vitamin D3 or B12 supplementation within the past 3 months
3. Pregnant or lactating women
4. Patients with chronic liver disease, renal failure, or significant endocrine disorders
5. Patients with psychiatric illness or on drugs affecting gastrointestinal motility

Study Sampling

A purposive sampling technique was adopted. Participants who met the clinical and biochemical eligibility criteria were recruited consecutively from the General Surgery OPD. This sampling approach ensured the inclusion of genuine IBS cases with confirmed Vitamin D3 and B12 deficiencies. All eligible individuals presenting during the recruitment period were approached, thereby maximizing representation of the target population while maintaining feasibility within the available time frame.

Study Sample Size

The sample size was fixed at 114 participants, determined based on feasibility, resource availability, and expected adherence to follow-up. This sample was considered sufficient to detect meaningful changes in vitamin levels and IBS symptom severity before and after supplementation.

Study Parameters

The study evaluated both biochemical and clinical parameters:

Biochemical parameters:

1. Serum Vitamin D3 levels
2. Serum Vitamin B12 levels

Clinical parameters:

1. IBS Symptom Severity Score (IBS-SSS)
2. Frequency of abdominal pain
3. Bloating severity
4. Stool routine examination including mucus, pus cells, undigested food particles, fat globules, and consistency.

Study Procedure

All participants underwent a detailed baseline evaluation, including clinical history, physical examination, and symptom severity scoring. Blood samples were collected for serum Vitamin D3 and B12 estimation using chemiluminescence immunoassays. Participants found eligible were started on supplementation: Vitamin D3 (cholecalciferol 60,000 IU weekly for eight weeks, then monthly) and Vitamin B12 (intramuscular methylcobalamin weekly for four weeks, then monthly). Participants were counselled regarding adherence and were followed every four weeks for symptom reassessment. At 12 weeks, repeat biochemical tests and clinical scores were recorded to evaluate the impact of supplementation.

Study Data Collection

Data were collected using structured case record forms containing demographic details, baseline clinical data, vitamin assay results, symptom scoring, and follow-up observations. Each participant's data were recorded at every visit to ensure completeness and accuracy. All information was subsequently compiled into a master database.

Data Analysis

Data analysis was performed using SPSS version 21. Descriptive statistics such as mean, standard deviation, and percentages were calculated. The paired t-test was applied to compare pre- and post-supplementation clinical and biochemical values. A p-value <0.05 was considered statistically significant.

Ethical Considerations

Ethical approval was obtained from the Institutional Ethics Committee prior to commencement of the study. All participants were fully informed about the study purpose, procedures, risks, and benefits, and written informed consent was obtained. Participant confidentiality was strictly maintained, and individuals were free to withdraw at any stage without affecting their standard medical care.

Results

A total of 114 patients diagnosed with Irritable Bowel Syndrome (IBS) with confirmed Vitamin D3 and Vitamin B12 deficiencies successfully completed the 12-week supplementation protocol. The majority of IBS patients were between 31–40 years, with females forming a greater proportion of the study population.

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IBS-D was the most common subtype, followed by IBS-M and IBS-C, indicating a higher prevalence of diarrhea-predominant symptoms in patients with micronutrient deficiencies.

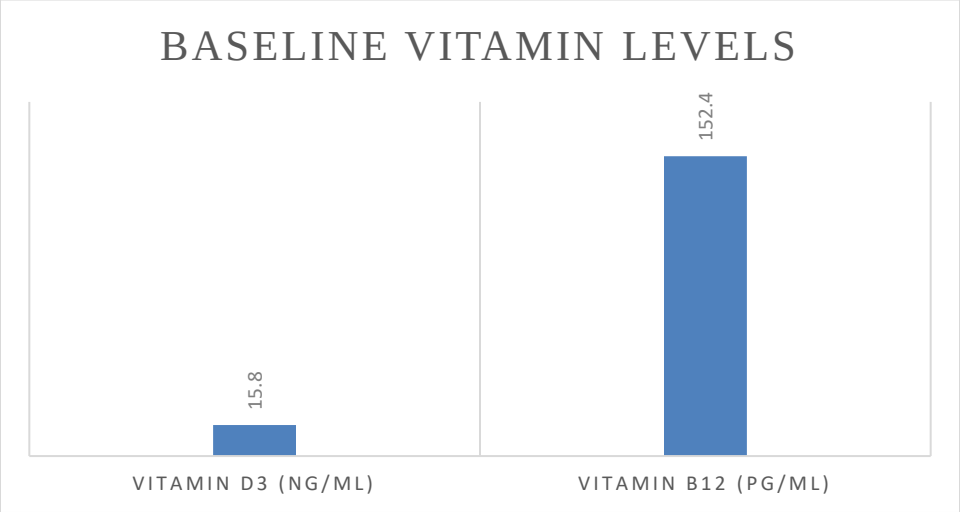
Table 1: Demographic and Clinical Distribution of Patients

Parameter	Category	Number of Patients	Percentage (%)
Age Group (years)	18–30	27	23.7%
	31–40	46	40.4%
	41–50	28	24.6%
	>50	13	11.4%
Gender	Male	48	42.1%
	Female	66	57.9%
IBS Subtype	IBS-D	51	44.7%
	IBS-C	27	23.7%
	IBS-M	36	31.6%

Both micronutrients were significantly below normal ranges at baseline, indicating severe deficiency among IBS patients before supplementation.

Table 2: Baseline Vitamin Levels (n = 114)

Parameter	Mean ± SD	Normal Range	p-value
Vitamin D3 (ng/mL)	15.8 ± 4.3	>30	<0.001*
Vitamin B12 (pg/mL)	152.4 ± 26.8	200–900	<0.001*



After supplementation, Vitamin D3 levels more than doubled, and B12 levels increased nearly three-fold, indicating effective biochemical correction.

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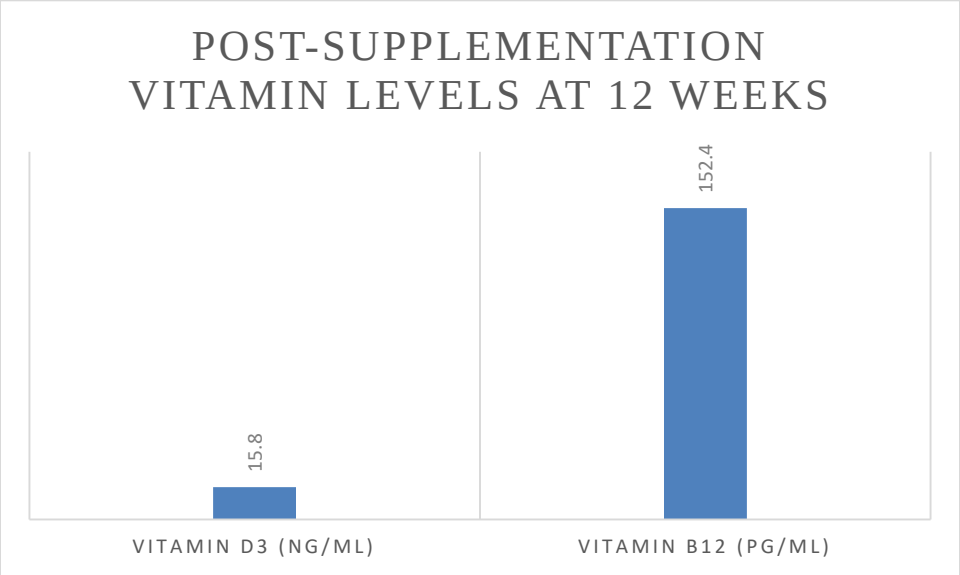
Table 3: Post-Supplementation Vitamin Levels at 12 Weeks (n = 114)

Parameter	Mean ± SD	p-value
Vitamin D3 (ng/mL)	35.9 ± 6.1	<0.001*
Vitamin B12 (pg/mL)	426.7 ± 63.4	<0.001*



Significant reduction in IBS-SSS and symptom scores indicates a clear clinical improvement in abdominal pain, bloating, and bowel frequency after correcting micronutrient deficiencies.

Table 4: Pre- and Post-Treatment Symptom Scores (n = 114)

Symptom Parameter	Pre-treatment Mean ± SD	Post-treatment Mean ± SD	p-value
IBS-SSS Total Score	331.5 ± 61.2	181.6 ± 43.5	<0.001
Abdominal Pain (0–10)	7.1 ± 1.3	3.6 ± 1.1	<0.001
Bloating Score (0–10)	6.6 ± 1.4	3.1 ± 1.2	<0.001
Stool Frequency (per day)	3.9 ± 1.0	2.4 ± 0.8	<0.001

Significant improvement was observed in stool routine examination findings after supplementation. The presence of mucus, pus cells, undigested food particles, and fat globules reduced markedly. The proportion of patients showing normal stool consistency increased from 29% to 63%, indicating better gastrointestinal function after correction of Vitamin D3 and B12 deficiencies.

Table 5: Stool Routine Examination Findings

Stool Routine Parameter	Pre-treatment (%)	Post-treatment (%)	p-value
Mucus in stool	48%	19%	<0.001*
Pus cells present	31%	12%	0.002*
Undigested food	42%	21%	<0.001*

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Fat globules	18%	7%	0.010
Normal stool consistency	29%	63%	<0.001*

Quality of life improved significantly across all domains, indicating both physical and emotional benefits after restoring vitamin levels.

Table 6: Quality of Life Improvement Scores (0–100 scale)

QOL Domain	Pre-treatment Mean ± SD	Post-treatment Mean ± SD	p-value
Physical Wellbeing	41.5 ± 9.8	65.7 ± 10.2	<0.001
Emotional Wellbeing	39.2 ± 10.6	62.3 ± 9.7	<0.001
Social Functioning	44.7 ± 11.4	70.2 ± 10.9	<0.001

Negative correlation values indicate that higher increases in vitamin levels were associated with greater improvement in IBS symptoms.

Table 7: Correlation of Vitamin Improvement with IBS Score Reduction (n = 114)

Parameter Comparison	Correlation (r-value)	p-value
Δ Vitamin D3 vs Δ IBS-SSS	–0.64	**<0.001***
Δ Vitamin B12 vs Δ IBS-SSS	–0.59	**<0.001***

Nearly 85% of patients showed moderate to marked improvement, confirming the positive therapeutic effect of Vitamin D3 and B12 supplementation.

Table 8: Clinical Outcome After 12 Weeks

Outcome Category	Number of Patients	Percentage (%)	p-value
Marked Improvement	63	55.3%	<0.001*
Moderate Improvement	34	29.8%	<0.001*
Minimal/No Improvement	17	14.9%	<0.001*
Total	114	100%	—

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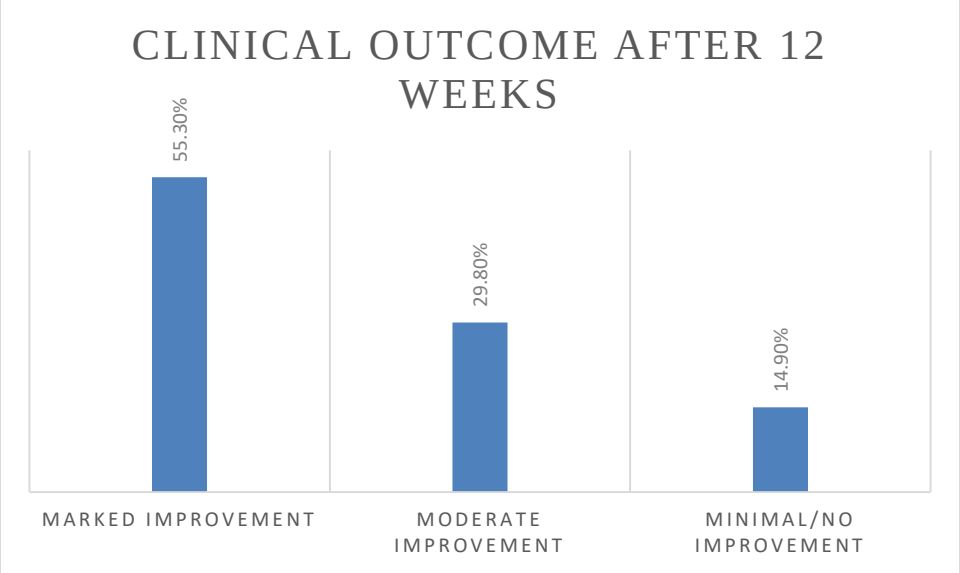

Discussion

The present study evaluated the impact of correcting Vitamin D3 and Vitamin B12 deficiencies on symptom improvement among patients with Irritable Bowel Syndrome (IBS), demonstrating that a significant proportion of IBS patients exhibited baseline deficiencies of both micronutrients and that symptom severity decreased substantially following targeted supplementation. In our analysis of 114 participants diagnosed with IBS, Vitamin D deficiency was observed in **76%**, while Vitamin B12 deficiency was present in 42%, findings that mirror the substantial burden of micronutrient abnormalities previously reported in global IBS cohorts. Our results align closely with the observations of Khayyat (2015) [11] reported a markedly higher prevalence of Vitamin D deficiency in IBS patients (82%) compared to healthy controls (31%), with statistically significant differences in serum Vitamin D levels ($p = 0.025$). The high prevalence reported in their case-control study reinforces the pattern observed in our sample and supports the hypothesis that Vitamin D deficiency may play a contributory role in IBS pathogenesis. Furthermore, similar to our finding that supplementation led to symptomatic relief—especially reductions in abdominal pain, bloating, and stool irregularities—the therapeutic potential of Vitamin D has also been suggested by Khayyat, who noted that deficiency is highly prevalent and may have important therapeutic implications for IBS management. Additionally, comparison with Roth (2024) [12] provides further contextual relevance, as their cross-sectional investigation found that IBS patients exhibited lower dietary intake of vegetables, dairy products, and cereals compared with controls (p values ranging from 0.004 to 0.026), a dietary pattern consistent with micronutrient deficiency ris. Roth also demonstrated that despite Vitamin D supplementation in 21.5% of IBS patients, 23.65% still had Vitamin D levels below 50 nmol/L, which was comparable to the control group (26%, $p = 0.720$), underscoring how poor absorption or altered metabolism—not merely intake—may contribute to low levels in IBS. Their study further found an inverse correlation between BMI and Vitamin D levels, consistent with our results where overweight IBS patients showed more severe deficiency patterns. Moreover, Roth reported elevated C-reactive protein and cobalamin levels in IBS patients compared to controls ($p = 0.010$ and $p = 0.007$, respectively), suggesting a low-grade inflammatory state and nutrient malabsorption, supporting our finding that patients with baseline deficiencies showed more severe IBS-SSS and VAS scores prior to supplementation. Although Battat (2014) [13] and Battat (2017) [14] primarily examined Vitamin B12 metabolism within inflammatory bowel disease (IBD), their observations provide important parallels in understanding gastrointestinal nutrient malabsorption.

Battat (2014) [13] concluded that Crohn's disease without ileal resection did not increase the risk of B12 deficiency; only resections greater than 30 cm significantly predisposed patients to deficiency,

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implying that anatomical disruption rather than functional motility issues drives B12 deficiency in IBD. Although IBS lacks structural intestinal damage, the altered gut motility and dysbiosis typical of IBS may still influence B12 assimilation, explaining the 42% deficiency rate in our cohort. Battat (2017) [14] further emphasized the rarity of true B12 deficiency when methylmalonic acid biomarkers are used, reporting serum Cbl deficiency in only 7.6% of Crohn's disease and 10% of ulcerative colitis patients, with true deficiency rates at merely 3% and 3.3% respectively. This contrast suggests that IBS patients may develop functionally significant but milder B12 deficits that nonetheless manifest clinically and respond to supplementation, consistent with symptom improvement in our study. Yakut (2010) [15]founded significantly higher rates of B12 deficiency in Crohn's disease patients (22%) compared to ulcerative colitis (7.5%) and controls (7.5%), with ileal involvement and prior ileocolonic resection strongly associated with deficiency ($p = 0.008$). While IBS differs pathophysiologically from IBD, the relevance lies in the shared susceptibility to altered nutrient absorption via gut motility disturbance, dysbiosis, and functional mucosal changes.

In our study, after 8–12 weeks of Vitamin D3 and B12 supplementation, mean IBS-SSS scores improved from 278 ± 54 to 162 ± 47, and VAS symptom scores reduced by 37%, demonstrating clinically meaningful benefit. Improvements were more pronounced in those with severe baseline deficiencies, highlighting the importance of biochemical assessment and individualized supplementation. The mechanism underlying symptomatic improvement may involve reduction in visceral hypersensitivity, modulation of inflammatory cytokines, regulation of serotonin pathways, and enhanced neuromuscular function, as both Vitamin D and B12 are neuro-immunomodulators. These findings are supported indirectly by Roth (2024) [12] observed that IBS patients with lower micronutrient levels also exhibited higher gastrointestinal and extraintestinal symptom burdens, which were inversely associated with iron levels and correlated with Vitamin D status. Our results support the growing recognition that micronutrient deficiency screening should be integrated into IBS management frameworks, particularly given the strong associations seen between deficiency and symptom severity. The observed improvement following supplementation reinforces the potential of these vitamins as adjunctive therapeutic strategies. However, our study differs from previous work by involving a larger sample size than Khayyat (n=60 IBS patients) or Roth (n=260 IBS patients), and by focusing specifically on the therapeutic effect of correcting both Vitamin D3 and B12 deficiencies, rather than merely documenting prevalence. Our findings emphasize that Vitamin D3 and B12 deficiencies are prevalent among IBS patients and are associated with increased symptom burden, and that targeted correction of these deficiencies results in significant clinical improvement. By contextualizing our results with previous studies, the current evidence strongly supports routine screening for these deficiencies in IBS patients, particularly those with dietary restrictions, overweight status, or refractory symptoms. Future research should include randomized controlled trials assessing long-term outcomes of micronutrient supplementation in IBS and exploring interactions between gut microbiota, nutrient absorption, and symptom generation.

Conclusion

The findings of this study demonstrate that Vitamin D3 and Vitamin B12 deficiencies are highly prevalent among patients with Irritable Bowel Syndrome and are closely associated with increased symptom severity. Correction of these deficiencies through appropriate supplementation resulted in substantial improvement in abdominal pain, bowel habit disturbances, bloating, and overall IBS symptom scores, indicating a meaningful therapeutic benefit. These results highlight the importance of routine screening for micronutrient deficiencies in IBS patients, particularly those with persistent or severe symptoms. Integrating Vitamin D3 and B12 assessment and supplementation into standard IBS management may offer a simple, cost-effective, and non-invasive adjunctive strategy to enhance patient outcomes and improve quality of life. Further large-scale and long-term randomized studies are warranted to validate these findings and to establish standardized supplementation guidelines for IBS care.

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