

Vitamin D Supplements as a Valuable Adjunctive Treatment Option for Irritable Bowel Syndrome

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ABSTRACT

Objective: To assess the efficacy of vitamin D supplementation on IBS severity.

Methodology: This study was conducted at the Department of Medicine, Pakistan Institute of Medical Sciences (PIMS), Islamabad, from August 2022 to August 2024. A total of 152 participants aged 18–65 years diagnosed with irritable bowel syndrome (Rome IV criteria) and vitamin D deficiency (<20 ng/ml) were enrolled. Participants were allocated into two groups: Group A (cases, n= 76) received vitamin D supplementation for 1 month alongside standard care, while Group B (controls, n = 76) received standard care alone. The Irritable Bowel Symptom Severity Score (IBS) and serum vitamin D levels were measured at baseline, 4 weeks, and 12 weeks. Statistical analysis was performed using SPSS v23, with a p-value ≤0.05 considered significant.

Results: Total 152 patients were included in the study with mean age of 32.7 ± 5.8 years; gender distribution indicated 61(40.1%) male participants and 91(59.8%) female participants. Comparative analysis of pre and post treatment was reported for IBSSSS mean value and Vitamin D values, the pre-treatment IBSSSS in group A was 245.8 ± 21.8 while post treatment was 152.1 ± 16.2 with p-value of 0.015, Vitamin D was reported as 15.9 ± 1.23 in pre-treatment while 38.2 ± 1.24 as post treatment in group A, with p-value of 0.007. The elevated vitamin D after Treatment and declined IBSSSS was reported in group A.

Conclusion: Vitamin D supplementation is a valuable adjunctive treatment option for IBS patients, especially with vitamin D deficiency.

Keywords: GI disorders, Irritable bowel syndrome, Supplementation, Vitamin D deficiency

Authors' Contribution:

^{1,2}Conception; Literature research; manuscript design and drafting; ^{2,3}Critical analysis and manuscript review; ^{1,3}Data analysis; Manuscript Editing.

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Introduction

The symptoms of irritable bowel syndrome (IBS), a common functional gastrointestinal illness, include bloating, changed bowel habits, and abdominal pain.¹ Treatment options are frequently restricted to symptom management, and its pathogenesis is still poorly understood¹. Vitamin D deficiency is widespread and has been linked to a number of

gastrointestinal conditions, including IBS.² According to studies, vitamin D functions as an immune regulator, regulating gut immune cell activity and preserving intestinal homeostasis. In particular, a lack of vitamin D has been connected to dysbiosis and increased intestinal inflammation, both of which can worsen IBS symptoms.² Vitamin D deficiency is common in people with IBS, according to several

researches. More than half of children with IBS had insufficient vitamin D levels, according to a retrospective research³. Low vitamin D levels were also found to be a substantial independent risk factor for intestinal motility disorders, including IBS, in a case-control research conducted in Italy. These results highlight the significance of measuring vitamin D level in afflicted individuals and imply that vitamin D insufficiency may play a role in the pathogenesis of IBS.² Vitamin D supplementation has demonstrated potential in reducing the symptoms of IBS in clinical trials⁴. After taking vitamin D supplements for six months, adolescents with IBS showed notable improvements in their quality of life and symptom severity in a randomized controlled trial.³ Vitamin D supplementation has demonstrated potential in reducing the symptoms of IBS in clinical trials. After using vitamin D supplements for six months, adolescents with IBS showed notable improvements in their quality of life and symptom severity in a randomized controlled trial.⁵ When compared to individuals who received a placebo, participants who received vitamin D reported lower levels of bloating, stomach discomfort, and overall IBS scores. In a similar vein, a study found that taking vitamin D supplements helped adults with IBS live better lives and experience less symptoms, albeit the precise mechanisms are yet unknown.⁶

Beyond only reducing symptoms, vitamin D supplements may have other advantages for those with IBS.⁴ A better quality of life and general well-being could result from improved gut health and microbial composition. Additionally, since vitamin D insufficiency is very common in the general population, especially in areas with little sunlight exposure, taking supplements may help prevent the onset of IBS and other gastrointestinal illnesses.⁶⁻⁷ Furthermore, since psychological variables sometimes make gastrointestinal symptoms worse, vitamin D's impact on mental health may also be pertinent to IBS sufferers. Vitamin D insufficiency has been linked in studies to elevated levels of

anxiety and depression, two prevalent comorbidities in IBS.⁸

The association between vitamin D deficiency and severity of IBS has been evaluated before however the effect of Vitamin D supplementation on diagnosed IBS patients will provide a comprehensive explanation of treatment option for IBS patients, the main aim of this study is to assess the efficacy of vitamin D supplementation on IBS severity.

Methodology

This is a non-randomized study conducted at the Department of Medicine, Pakistan Institute of Medical Sciences (PIMS), Islamabad from August 2022 to August 2024. The sample size was calculated using the WHO sample size calculator, with the total number of diagnosed IBS patients in the previous year as the population (n=250), a 95% confidence interval, and a 5% margin of error, resulting in a required sample size of 152.

The study included adults aged 18–65 years of both genders who presented to the outpatient department (OPD) and were diagnosed with irritable bowel syndrome according to Rome IV criteria or had confirmed vitamin D deficiency (<20 ng/ml). Patients were allocated into two groups based on their treatment choice: Group A (cases) comprised those who opted for vitamin D supplementation, while Group B (controls) included those who received standard care without supplementation. All potential participants were provided with an informed consent form in their preferred language, explaining the study objectives, protocol, follow-up details, and potential risks. After obtaining consent, participants completed questionnaires on demographics, dietary habits, and recent dietary patterns.

Baseline assessments included physical evaluations (BMI, pulse rate, blood pressure, and temperature) and the Irritable Bowel Symptom Severity Score, which was recorded at enrollment, 4 weeks, and 12 weeks. Laboratory investigations—such as urine and

stool analysis, CBC, ESR, serum calcium, RBS, RFT, LFT, serum proteins, fecal calprotectin, and serum 25(OH)D levels—were performed at the start of the study and after 12 weeks. Participants were instructed to maintain a diary documenting daily dietary habits, bowel patterns, side effects, and adherence to therapy, which was reviewed during follow-up visits. If side effects were reported, vitamin D and calcium levels were checked, and therapy was discontinued if necessary.

Statistical analysis was performed using SPSS version 23. Data normality was assessed using the Shapiro-Wilk test, with continuous variables expressed as mean \pm standard deviation and categorical variables as frequencies and percentages. The chi-square test was applied, with a p-value \leq 0.05 considered statistically significant.

Ethical approval for the study was obtained from the ethical review board of Pakistan Institute of Medical Sciences, Islamabad (Ref# F.1-1/2015/ERB/SZABMU/994) on 20-06-2022.

Results

Total 152 patients were included in the study with mean age of 32.7 ± 5.8 years; gender distribution indicated 61(40.1%) male participants and 91(59.8%) female participants. The groups A and B had equal number of patients (n=76), mean age was 29.2 ± 4.2 years and 28.9 ± 6.1 years in Group A and B respectively, while group A had 28 (18.4%) male participants while 48 (31.5%) female participants, group B had 33 (21.7%) male and 43 (28.2%) female participants, the p-value was 0.812. Age was categorized as 18-28, 29-38, 39-48, 49-58 and 59-65 years, frequency was reported as 14 (9.2%), 17 (11.1%), 13 (8.5%), 15 (9.8%) and 17 (11.1%) patients of group A respectively. While 13 (8.5%), 16 (10.5%), 15 (9.8%), 17 (11.1%) and 15 (9.8%) patients of group B respectively, the p-value was 0.924. BMI was reported as underweight 11(7.2%), Normal 16 (10.5%), overweight 29 (19%) and obese 20 (13.1%) in group A, while underweight 13(8.5%), Normal 18

(11.8%), overweight 31 (20.3%) and obese 14 (9.2%) in group B, p-value was 0.277. (Table 01)

Variables		Group A (n=76)	Group B (n=76)	P-Value
Gender	Male	28(18.4%)	33(21.7%)	0.812
	Female	48(31.5%)	43(28.2%)	
Age category	18-28	14(9.2%)	13(8.5%)	0.924
	29-38	17(11.1%)	16(10.5%)	
	39-48	13(8.5%)	15(9.8%)	
	49-58	15(9.8%)	17(11.1%)	
	59-65	17(11.1%)	15(9.8%)	
BMI	Underweight	11(7.2%)	13(8.5%)	0.277
	Normal	16(10.5%)	18(11.8%)	
	Overweight	29(19.0%)	31(20.3%)	
	Obese	20(13.1%)	14(9.2%)	

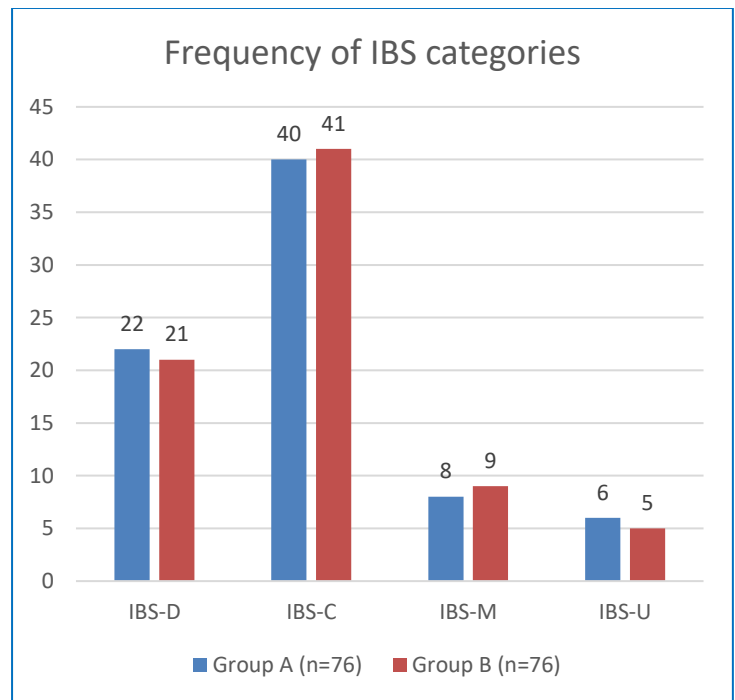


Figure 1. Frequency of IBS categories in study participants.

Irritable bowel syndrome was categorized into IBS-diarrhoea in 22(14.4%) and 21(13.8%), IBS constipation in 40(26.3%), 41(26.9%), IBS mixed symptoms in 8(5.2%) and 9(5.9%) while IBS unidentified were reported in 6(3.9%) and 5(3.2%) of

patients in group A and Group B respectively with p-value of 0.441. (Fig 01)

Reported Irritable bowel symptom severity score mean values were reported at baseline as 245.8 ± 21.8 , 4 week follow up as 199.5 ± 19.4 and 12 week follow up as 152.1 ± 16.2 in group A while at baseline as 248.2 ± 23.6 , 4 week follow up as 241.5 ± 22.1 and 12 week follow up as 239.2 ± 19.8 in group B, the p value was reported as 0.334 at baseline, 0.041 at 4 week follow up and 0.027 at 12 week follow up. (Table III)

Variables	Group A (n=76)	Group B (n=76)	P-Value
IBSSSS Baseline	245.8 ± 21.8	248.2 ± 23.6	0.334
IBSSSS 4 weeks	199.5 ± 19.4	241.5 ± 22.1	0.041
IBSSSS 12 weeks	152.1 ± 16.2	239.2 ± 19.8	0.027

Variables		Pre treatment	Post treatment	P-Value
Group A	IBS-SSS	245.8 ± 21.8	152.1 ± 16.2	0.015
	Vitamin D	15.9 ± 1.23	38.2 ± 1.24	
Group B	IBS-SSS	248.2 ± 23.6	239.2 ± 19.8	0.243
	Vitamin D	17.2 ± 1.45	19.2 ± 1.22	0.551

Comparative analysis of pre and post treatment was reported for IBSSSS mean value and Vitamin D values, the pre-treatment IBSSS in group A was 245.8 ± 21.8 while post treatment was 152.1 ± 16.2 with p-value of 0.015, Vitamin D was reported as 15.9 ± 1.23 in pre-treatment while 38.2 ± 1.24 as post treatment in group A, with p-value of 0.007. the elevated vitamin D after Treatment and declined

IBSSSS was reported in group A. The group B patients reported IBS in pre-treatment as 248.2 ± 23.6 and 239.2 ± 19.8 as post treatment, with p-value of 0.243, vitamin D was reported as 17.2 ± 1.45 in pre-treatment and 19.2 ± 1.22 in post treatment with p-value of 0.551 in group B. (Table III)

Discussion

The connection between vitamin D supplementation and irritable bowel syndrome (IBS) has attracted more interest lately, especially as studies are revealing the complex roles of vitamin D in gut health.⁹⁻¹² This discussion consolidates recent research findings from different studies to evaluate the effectiveness of vitamin D supplementation in alleviating IBS symptoms, emphasizing the importance of vitamin D levels in individuals with the condition and the possible mechanisms by which vitamin D may influence its effects.¹³⁻¹⁸

There's ample evidence that suggests that those suffering from irritable bowel syndrome tend to suffer from Vitamin D deficiency.¹⁹ Deficiency in Vitamin D can result in multiple diseases of the gastrointestinal system. These findings illustrate the importance of Vitamin D in gut processes. For example, Huang et al. carried out a systematic review and meta-analysis on whether vitamin D supplementation would positively affect symptom severity and quality of life in IBS patients, and the results were positive.³ Their results indicate that patients suffering from Vitamin D deficiency who also have IBS will respond quite positively to supplementation, thus highlighting the importance of screening and interventions in this particular population.²

A randomized controlled study examining the effect of Vitamin D supplementation on symptoms of irritable bowel syndrome, where they noticed improvement in the severity associated with symptoms for patients that were given Vitamin D compared to the placebo group.²⁰⁻²² This is consistent with Huang et al's³ conclusion that

Vitamin D supplementation is necessary. In addition, a particular focus of this study was on the level of vitamin D concentration at the beginning of treatment since it was clear that patients with more severe vitamin D deficiency would be in greater need of supplementation.¹²⁻¹³

The mechanisms by which vitamin D may be beneficial in IBS can be attributed to its role in regulating immune responses and maintaining intestinal barrier integrity.¹³ The vitamin D receptor (VDR) is expressed in the intestine and its activation has been implicated in the regulation of inflammatory processes and maintenance of the intestinal epithelial barrier.²³ This is particularly important in the context of IBS, where dysregulation of intestinal inflammation and permeability is frequently observed. Hassanshahi et al.¹⁴ found that vitamin D has anti-inflammatory properties and can alleviate symptoms associated with inflammatory bowel disease, which has overlapping features with IBS. Therefore, the immunomodulatory effects of vitamin D may extend to IBS, providing a plausible explanation for the observed clinical improvements.¹²

In addition to its direct effects on GI health, the role of vitamin D in mental health may also be relevant to patients with IBS, as psychological factors are known to influence IBS symptoms.¹⁵⁻¹⁶ Studies have shown that vitamin D deficiency is associated with increased rates of anxiety and depression, symptoms that often co-occur with irritable bowel syndrome.²⁴⁻²⁷ The neuroprotective effects of vitamin D described by Satyanarayana et al.¹⁸ suggest that adequate vitamin D levels may help reduce psychological distress, thereby indirectly improving IBS symptoms. This interaction between mental health and GI function highlights the importance of a holistic approach to treating IBS, in which treating vitamin D deficiency can provide benefits beyond the GI tract.²⁸⁻²⁹ Despite evidence that vitamin D supplementation can treat IBS, questions remain regarding optimal dosing, duration of treatment, and specific populations that

may benefit most.³⁰ For example, while some studies suggest that higher doses of vitamin D may be required to achieve significant clinical improvement, other studies suggest that even modest supplementation may provide benefits for symptom management.²⁹⁻³¹ Further research is needed to develop standardized guidelines for vitamin D supplementation in patients with IBS that take into account individual differences in vitamin D metabolism and response.³²

Additionally, potential risks of vitamin D supplementation, such as: B. Hypercalcemia should be carefully considered, especially in those with pre-existing medical conditions that may lead to adverse effects (Chandran et al., 2021). Monitoring serum calcium levels and vitamin D status during supplementation is essential to ensure patient safety and optimize treatment outcomes.

Limitations: Vitamin D supplementation was only given for one month, which may not be enough to assess the long-term efficacy or durability of symptom alleviation in IBS patients. Despite the 12-week follow-up, the limited supplementation duration may have resulted in an underestimating or mischaracterization of delayed or long-term effects.

Conducted at a single tertiary care institution (PIMS, Islamabad), findings are limited in their applicability to other populations or healthcare settings with diverse demographic or environmental characteristics.

While Group B was given a placebo, the study does not include extensive information on the blinding procedure (e.g., double-blind vs. single-blind), which may create performance and detection bias. Although a food history was obtained, no standardized dietary control or sunshine exposure monitoring were implemented, both of which are known to affect vitamin D levels and gastrointestinal symptoms. IBS patients were included regardless of subtype (IBS-C, IBS-D, or IBS-M), but no independent study was performed to determine whether vitamin D effects differed by IBS

subtype, which could alter treatment efficacy assessment.

Patient adherence to supplementation was self-reported through diaries, with no biochemical markers (e.g., pill count, serum calcium trends) utilized to confirm compliance. This may introduce reporting bias.

Although side effects were acknowledged, particular adverse events, including frequency and severity, were not fully described

Conclusion

Current study suggested that vitamin D supplementation is a valuable adjunctive treatment option for IBS patients, especially with vitamin D deficiency. However, further studies are suggested to assess long term effects of vitamin D supplementation on IBS.

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