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## A cross-sectional study clarifying the possible connection Between Irritable Bowel Syndrome and Serum Level of Vitamin D

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### Abstract:

#### Background and Aim:

Irritable bowel syndrome (IBS) is among the most common chronic functional gastrointestinal disorders, affecting approximately 10%–22% of adults. Vitamin D has been linked to several systemic conditions; however, its exact role in IBS remains unclear. This study aimed to evaluate the possible association between serum vitamin D levels and IBS.

**Patients and Methods:** A cross-sectional study was conducted on 100 participants divided into two groups: Group I included 50 patients diagnosed with IBS according to the Rome IV criteria. At the same time, Group II consisted of 50 healthy subjects serving as controls. Serum vitamin D levels were measured in both groups.

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**Results:** A statistically significant difference was observed between the two groups in terms of vitamin D levels ( $p$ -value = 0.012). Among IBS patients, 19 (38%) had sufficient vitamin D ( $>30$  ng/mL), while 31 (62%) had subnormal levels. In contrast, 34 (68%) of the control group had sufficient levels, and 16 (32%) were deficient.

**Conclusions:** Vitamin D deficiency may represent a contributing factor in IBS. Therefore, routine assessment of vitamin D levels could be beneficial in patients presenting with IBS.

**Keywords:** *Vitamin D, Irritable bowel syndrome, Rome IV.*

## **Introduction:**

Irritable bowel syndrome (IBS) is one of the most common functional gastrointestinal disorders, affecting around 10%–22% of adults. It is characterized by abdominal pain, altered bowel habits, bloating, and other nonspecific gastrointestinal symptoms, with no detectable structural or biochemical abnormalities [2].

According to the Rome IV criteria, IBS is classified into four subtypes: constipation-predominant (IBS-C), diarrhea-predominant (IBS-D), mixed (IBS-M), and unclassified (IBS-U) [3].

Vitamin D plays a crucial role in the absorption of calcium and phosphate, as well as in regulating the secretion of parathyroid hormone. The main circulating form, 25-hydroxyvitamin D (25(OH)D), is the most reliable indicator of vitamin D status [4].

Several systemic diseases have been associated with vitamin D deficiency, raising the question of its involvement in gastrointestinal disorders, including IBS [5,6]. While its precise role is still under investigation, some studies have reported symptom improvement in patients with diarrhea-predominant IBS following high-dose vitamin D supplementation [7].

Vitamin D also has a wide range of biological functions, regulating more than 200 genes involved in cell proliferation, differentiation, and apoptosis. Its receptor is expressed in many tissues, including the gastrointestinal tract, nervous system, and immune cells [8].

Based on this evidence, the present study aimed to explore the potential association between serum vitamin D levels and IBS.

## **Patients and Methods**

This cross-sectional study was conducted on 100 individuals who attended the Tropical Medicine outpatient clinic at Tanta University Hospital, Faculty of Medicine, between October 2023 and January 2025. Eligible participants were males and females aged 18–50 years, with or without a diagnosis of IBS. While we excluded patients aged  $< 18$  and  $> 50$

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years old, Patients with chronic diseases, Pregnant or lactating females, Postmenopausal females, patients with organic gastrointestinal disorders, any treatment with steroids, vitamin D, or calcium, any gastrointestinal malignancies, and individuals with a family history of inflammatory bowel disease (IBD).

Participants were divided into two groups:

Group I: included 50 patients who complained of abdominal pain and met the criteria of IBS based on the Rome IV Criteria as the gold standard for the diagnosis of IBS. Group II consisted of 50 subjects, serving as the control group. All patients were subjected to full history taking, anthropometric measures: weight, length, BMI, Waist circumference and complaints including ROME IV criteria for IBS, which are recurrent abdominal pain on average at least 1 day/week in the previous 3 month linked with two or more of the following criteria: 1. related to defecation 2. associated with a change in frequency of stool 3 . associated with a change in form (appearance) of stool [9].

Specific subtypes of IBS categorize patient symptoms into constipation-predominant (IBS-C), diarrhea-predominant (IBS-D), mixed (IBS-M), or unclassified (IBS-U) [10].

Complete blood picture (CBC), Lipid profile (triglycerides, HDL, LDL, cholesterol level), Fasting Blood glucose level and or HBA1C, Liver enzymes. (ALT, AST), CRP, fecal calprotectin. A blood sample was taken to measure vitamin D in serum.

(25-hydroxyvitamin D). Ultrasounds of the abdomen and pelvis were performed for all participants.

## Results

Data analysis was conducted using the Statistical Package for the Social Sciences (SPSS), version 22.0 (Armonk, NY: IBM Corp, USA). Quantitative data were analyzed using an independent t-test and presented as the mean  $\pm$  standard deviation (SD). Qualitative data were reported as frequencies and percentages. The Chi-square ( $X^2$ ) test of significance was applied to compare proportions between two qualitative parameters. Results were considered significant when  $P < 0.05$  and non-significant when  $P > 0.05$ .

This cross-sectional study was conducted among 100 patients who visited the Tropical Medicine outpatient clinic at Tanta University's Faculty of Medicine. The following results were statistically extracted from the patients' data.

*Table 1. Demographic characteristics of the studied cases and control groups (N=100)*

characteristics	Group I (50)	Group (II) (50)	P-value
<b>Age</b>	41.76±4.62	41.3±5.22	0.64
<b>Sex</b>			0.31
Male	18 (36%)	23 (46%)	
Female	32 (64%)	27 (54%)	
<b>Waist circumference</b>	86.16±7.22	85.66±6.57	0.72
<b>Smoking</b>			0.63
Nonsmoker	40 (80%)	38 (76%)	
Smoker	10 (20%)	12 (24%)	
<b>Diabetes</b>			0.77
Non-diabetic	44 (88%)	43 (86%)	
Diabetic	6 (12%)	7 (14%)	

This table shows no statistically significant difference between the studied groups corresponding to age and waist circumference, with P values of 0.64 and 0.72, respectively, and they were classified into 36% males and 64% females in the case group; meanwhile, they were 46% males and 54% females in the control group.

Corresponding to other demographic data, including smoking and diabetes prevalence between groups, there was no statistically significant difference, as the case group consisted of 80% non-smokers and 20% smokers, compared to 76% non-smokers and 24% smokers in the control group. Also, in the cases group, there were 88% non diabetic and 12% diabetic compared to 86% non diabetic and 14% diabetic in the control group.

*Table 2. Distribution of different types of IBS in group I (N=50)*

GIT symptoms	Group I (50)
constipation	25 (50%)
diarrhea	11 (22%)
mixed	8 (16%)
unclassified	6 (12%)

IBS clinical subtypes according to this table were distributed in group I as follows, with a higher prevalence of the constipating subtype 50% followed by the diarrheal subtype 22%, the mixed subtype 16%, % and lastly, the unclassified subtype, 12% of cases

*Table 3. Distribution of Psychiatric symptoms in group I (N=50)*

Psychiatric symptoms	Group I (50)
No symptoms	34 (68%)
Sleep disturbances	8 (16%)

Depression	8 (16%)
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Other clinical features, including psychiatric manifestations, were prevalent in the cases in the form of sleep disturbances in about 16% and depression in about 16 % of patients. In comparison, the remaining 68% were free from psychiatric manifestations.

Table 4. Serum vitamin D level among the studied groups (N=100)

Vitamin D level	Group I (50)	Group II (50)	P-value
More than 30	19 (38%)	34 (68%)	0.012*
Less than 30	31 (62%)	16 (32%)	

As corresponding to vit d level in both groups, there was statistically significant difference between the two groups with p value 0.012 as explained in the table 4, vitamin D level was more than 30 in 19(38%) and less than normal range in 31(62%) of patients compared to 34(68%) were with normal range and 16(32%) were under normal in the control group.

Table 5. Multivariate regression analysis for factors predicting IBS.

	OR (CI 95%)	P value
Age	1.045 (0.951 – 1.149)	0.359
Smoking	0.740 (0.206 – 2.660)	0.645
DM	2.021 (0.584 – 6.996)	0.267
Sex	0.963 (0.297 – 3.125)	0.950
Waist circumference	0.996 (0.931 – 1.065)	0.897
Vit.D	0.315 (0.126 – 0.784)	0.013*

Multivariate regression analysis between both groups shows only a statistically significant difference corresponding to the level of vitamin D, with a p value of 0.013; meanwhile, other clinical and demographic risk factors, including age, sex, smoking, central obesity, and DM, were non-significant. This aligned with the work's aim, as it demonstrated the difference in vitamin D levels between individuals with IBS and healthy subjects.

## Discussion

IBS is a chronic GI disorder, and the most common functional gastrointestinal (GIT) disorder, characterized by recurrent abdominal pain and altered bowel habits, and a change in frequency or consistency of stool with a significant impact on the quality of life [11]. According to the Rome IV criteria, the diagnostic tool used to identify IBS and other functional gastrointestinal disorders, IBS is characterized as a disorder of the gut-brain axis

[12]. Several studies have reported the prevalence of IBS in various regions using the Rome IV diagnostic criteria. According to recent data and meta-analysis, the global prevalence of IBS ranges from 7.3% to 11.2% [13]. Vitamin D, a fat-soluble vitamin known for its role in bone metabolism, has also been observed to possess anti-inflammatory and immune-modulating properties % [14]. An emerging body of evidence has highlighted the prevalence of Vitamin D deficiency among IBS patients and has explored the potential benefits of Vitamin D supplementation in alleviating IBS symptoms [15].

This recent trend highlighting the potential link between Vitamin D deficiency and IBS has incited numerous studies to explore the role of Vitamin D supplementation on IBS symptoms. Researchers have shed light on the anti-inflammatory and immune-modulating properties of Vitamin D, which may help mitigate the symptoms of IBS and improve the quality of life for those affected. We aim to highlight the role of vitamin D deficiency in the development of IBS symptoms.

This cross-sectional study included 100 participants, equally divided into two groups after excluding 76 participants based on methodological criteria.

The average age in both groups is similar, with no significant difference (P-value = 0.64). Also, sex distribution was equal in both groups, with no significant difference (P-value = 0.31). This suggests that age and sex do not significantly impact the study outcomes.

Likewise, Population-based Surveys show that IBS prevalence varies by gender, with higher rates in women generally. However, in India, men have two to four times higher prevalence than women, while studies in Korea and China report no significant gender differences [16].

We found that the average waist circumference is slightly higher in Group I compared to Group II, but the difference is not statistically significant (P-value = 0.72). This suggests that waist circumference is not a major factor in this study.

Regarding smoking, the proportion of non-smokers and smokers was similar in both groups, with no significant difference (P-value = 0.63), and the distribution of non-diabetic and diabetic individuals is comparable in both groups, with no significant difference (P-value = 0.77). This suggests that diabetes and smoking habits are not confounding factors in our study.

Our data showed that the constipation subtype was the most prevalent symptom, affecting half of the patients. In contrast, the diarrhea subtype represented only 22% of patients, with 28% of cases classified as mixed or unclassified subtypes.

The distribution of psychiatric symptoms in group I showed that most IBS patients do not experience psychiatric symptoms, a notable portion suffer from sleep disturbances and depression. Higher anxiety and depression levels at baseline can predict IBS, according to the study done by Koloski et al. [17], who critically assessed psychiatric disorders, specifically anxiety and depression, as a causal relation with functional gastrointestinal disorders.

Multivariate regression analysis of our findings highlights the potential importance of Vitamin D in the pathogenesis of IBS. At the same time, other factors such as age, smoking, diabetes, sex, and waist circumference do not appear to have a significant impact. Further research is needed to explore the mechanisms underlying the relationship between Vitamin D and IBS and to develop effective strategies for managing IBS through Vitamin D supplementation.

The proportion of individuals with Vitamin D levels greater than 30 is significantly higher in group II (68%) compared to group I (38%), with a P-value of 0.0121. This indicates a statistically significant difference in Vitamin D levels between the two groups. These results were consistent with those of Jalili et al. [18] and Khalighi et al. [19]. While El Amrousy et al. [20] found that serum vitamin D levels were lower than 20 ng/mL. In the study conducted by Abbas Nezhad et al. [21], 65.9% of participants had serum vitamin D levels below 20 ng/mL, and 84.1% had levels below 30 ng/mL.

To explore the factors independently associated with IBS, multivariable regression analysis was performed. A significant finding is the association between vitamin D levels and the IBS group, with a P-value of 0.013, indicating statistical significance.

Our findings suggest that Vitamin D deficiency may be more prevalent among IBS patients compared to the healthy control group. This supports the hypothesis that Vitamin D deficiency may contribute to the pathogenesis of IBS. The significant difference in Vitamin D levels between the groups underscores the potential benefit of Vitamin D supplementation in managing IBS symptoms. Additionally, research conducted by Huang et al [22]. Suggests that vitamin D supplementation may improve symptoms and quality of life for IBS patients. Given its cost-effectiveness and safety profile, Vitamin D could be a practical treatment option for IBS. This discussion aims to delve deeper into the current evidence, explore potential therapeutic options for IBS, and identify areas for future research.

Despite these findings, the relationship between Vitamin D and IBS remains complex and multifaceted. The variability in study outcomes underscores the need for further research to elucidate the mechanisms underlying this association and establish standardized guidelines for Vitamin D supplementation in IBS management. Also, the limited sample size constrains the generalizability of these findings.

**Conclusion:** Vitamin D deficiency may be a contributing factor to IBS. Therefore, it is crucial to measure the level of Vitamin D in patients with IBS and treat any deficiency to alleviate the symptoms of IBS.

#### **Abbreviations:**

IBS: Irritable bowel syndrome  
VitD: vitamin D  
GIT: gastrointestinal tract  
IBD: inflammatory bowel disease  
IBS-C: IBS constipation predominant  
IBS-D: IBS diarrhea predominant



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IBS-M: IBS mixed  
IBS-U: IBS unclassified  
CBC: complete blood count  
ALT: alanine transaminase  
AST: aspartate transaminase

### Footnotes.

Sara Salem (lecturer in the internal medicine, gastroenterology, and hepatology unit), Nevin Fouad (Professor in the internal medicine, gastroenterology, and hepatology unit), and Amany Mohamed (Biostatistician and Professor of Family Medicine) were peer reviewers.

**E- Editor:** Salem Youssef Mohamed, Osama Ahmed Khalil, Amany Mohammed.

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### Ethics approval

Written informed consent was obtained from all participants before enrollment. Ethics committee approval was received for this study from the Institutional Review Board of Tanta Faculty of Medicine (approval code: 36264PR349/9/23), in accordance with the provisions of the 1975 Declaration of Helsinki. All patients and/or their legal guardian(s) provided written informed consent before participation in any protocol-specific procedure. None of the human participants in this study are minors. All methods were carried out in accordance with the guidelines and regulations of the Declaration of Helsinki.

**Data and materials availability:** The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

**Competing interests:** The authors declare that they have no competing interests.

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**This work** was conducted in accordance with the STROBE guidelines.

**Authors' contributions:**

EH and AE contributed substantially to the conception, design, interpretation of the results, and discussion of this article. FE and NK contributed to the supervised data collection, SE, AA, and SM interpreted the results, and drafted this article. All authors were responsible for writing, reviewing, and editing the manuscript revision. All of the authors have read and approved the final version of this manuscript.

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