# Study of the Elevation of Galectin-3 Level in Plasma Patients with Inflammatory Bowel Disease in Babylon Province

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# Abstract

**Background:** Inflammatory bowel disease is a collection of illnesses that mainly affect the colon and small intestine, the most prevalent types being Crohn's disease and ulcerative colitis. Carbohydrate-binding proteins (also known as galectins) have been shown to play an essential role in the regulation of both innate and adaptive immune responses. **Objective:** The aim of this study was to measure the amount of galectin-3 and look at any potential links between the protein and iron, and vitamin E in inflammatory bowel illness in Babylon province. **Materials and Methods:** Galectin-3 levels were evaluated in 100 people: 50 with inflammatory bowel disease and 50 with healthy people. The study participants and the healthy controls varied in age from 15 to 65. The enzyme-linked immunosorbent assay (ELISA) method measured Galectin-3 and vitamin E while Iron was in the spectrophotometer in the serum. **Results:** The serum Galectin-3 was greater in IBD patients than in controls (P = 0.01). In contrast, the current study discovered a negative association between Galectin-3 and iron in IBD patients (P = 0.05) and a non-significant relationship between Galectin-3 and vitamin E in IBD patients (P = 0.05). **Conclusion:** There is a significant association between IBD and high Galectin-3 levels in Babylon province patients.

Keywords: Galectin-3, inflammatory bowel disease, Iron, vitamin E

# INTRODUCTION

Inflammatory bowel diseases affect the colon and the small intestine, and the most prevalent kinds are Crohn's disease and ulcerative colitis.<sup>[1]</sup>Inflammatory bowel disease is a complicated condition that develops when environmental (such as smoking, air pollution and greenspace, urbanization, and Westernization) and genetic variables combine to cause immune responses and inflammation in the gut.<sup>[2]</sup>

Inflammatory bowel disease is becoming more common in the Arab world, with our combined estimates placing the annual incidence of ulcerative colitis at 2.33 and Crohn's disease at 1.46 per 100,000 people. Kuwait and Saudi Arabia seem to have the highest rates of irritable bowel syndrome. On the other hand, ulcerative colitis is more common than Crohn's disease among the populations of Iraq and Iran.<sup>[3]</sup>

Galectins are a class of carbohydrate-binding proteins found worldwide. Mammalian galectins include one or

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Quick Response Code:				
	Website: https://journals.lww.com/mjby			
	DOI: 10.4103/MJBL.MJBL_271_23			

two carbohydrate recognition domains (CRDs) with a primarily galactosidase-recognition activity.<sup>[4]</sup>

Galectins may be broken down into three classes based on the presence and purpose of CRD: Prototype Galectins have a single CRD and may form non-covalent homodimers. Galectins with a tandem repeat (TR) have two independent carbohydrate recognition domains (CRDs) that are connected by an unobserved 70-amino acid sequence.<sup>[5]</sup>

Chimera-type galectin (galectin-3), abundant in proline and glycine, has three CRDs and a distinct N-terminal domain of roughly 120 amino acids. The N-terminal

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Submission: 07-Mar-2023 Accepted: 05-Apr-2023 Published: 29-Mar-2025

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**How to cite this article:** Nasrullah AK, Shaker Al-joda BM, Aljumaily HS. Study of the elevation of galectin-3 level in plasma patients with inflammatory bowel disease in Babylon province. Med J Babylon 2025;22:93-7.

domain of Gal-3 may form homo-dimers and oligomers depending on ligand quantity and presence.<sup>[6]</sup>

Chronic inflammatory diseases such as rheumatoid arthritis, osteoarthritis, juvenile idiopathic arthritis, asthma, COPD exacerbation, inflammatory bowel disease (IBD), and Helicobacter pylori infection may all have a function for galectins in their pathogenesis.<sup>[7]</sup>

Strong evidence suggests that galectins play a crucial role in regulating innate and adaptive immune responses. Neutrophils, dendritic cells (DCs), monocytes/macrophages, eosinophils, and mast cells are all innate immune cells, and these lectins may affect their ability to recognize, engulf, and kill microbes and damaged cells as well as their chemotactic response, migration, cytokine production, and chemotaxis across endothelial cell surfaces. This is because certain galectins stimulate the innate immune system, while others have a role in reducing acute inflammation.<sup>[8]</sup>

Functional or absolute iron deficiency is the most common cause of anemia in IBD patients. A functional iron deficit occurs when insufficient iron is available to be incorporated into erythroid precursors, even if total body iron storage may be adequate. Patients with absolute anemia have iron stores in their bone marrow. The iron needed for regular or enhanced erythropoiesis is not accessible because other elements of the monocytemacrophage system in the liver and spleen are deficient. Assumed causes include increased blood loss, decreased iron absorption, and inadequate iron intake via food.<sup>[9]</sup>

Several fat-soluble vitamins, including vitamin E, may be depleted in patients with IBD during the active phase of the illness, therapy, or dietary restriction.<sup>[10]</sup>

Vitamin E's anti-inflammatory properties are particularly noticeable. Vitamin E's strong antioxidant capacity and anti-inflammatory action make it a likely candidate for use in treating ulcerative colitis and minimizing the severity of its aftereffects on the body.<sup>[11]</sup>

Recent research has shown that galectin-3 may be a biomarker for general IBD determination since it is produced from injured and inflamed cells into the surrounding fluids.

In this study, we aimed to review the recent discoveries on the association between iron, vitamin E, and Galectin-3 in inflammatory bowel disease patients.

# MATERIALS AND METHODS

# Study design

A case-control analysis was designed for this rewrite.

# **Patients and control**

One-hundred people participated in the current research. Fifty people with IBD (diagnosed using standard clinical, radiographic, endoscopic, and histological criteria) participated in the research; a complete medical history was collected from each participant, including their age, gender, family history, and smoking habits.

Fifty healthy people make up the second group (control group).

The study did not include individuals who met the following criteria: pregnancy, acute or chronic inflammatory illness, severe disease (such as heart failure, renal insufficiency, liver damage, or diabetes), or other related malignancies. These categories range in age from 15 to 65. The statistical analysis was performed using SPSS version 20. In the case of all findings shown as Mean SD, a value of P < 0.05 indicate statistical significance. Patients at the Gastro Intestinal and Hepatic facility at Merjan Medical City in Hilla, Babylon Province, Iraq, participated in this research. Starting in August 2022 and ending in January 2023.

## **Chemicals and methods**

1- Using a sandwich ELIZA kit to measure the blood's Galectin-3 and vitamin E levels. A micro-ELIZA plate specialized for Galectin-3, and vitamin E was pre-coated in this kit (Bioassay Technology Laboratory, ELIZA kit).

Iron content was determined using a colorimetric test based on the lipid clearing factor (LCF) CAB method.

# **Ethical issues**

According to the native ethics group, these studies were approved, and all patients who participated gave informed permission and provided information about the study's goal, according to document number 4 on 06/07/2022.

# RESULTS

The study groups consist of 100 adults designated into two categories:

- 1. Adults have inflammatory bowel disease (n = 50)
- 2. Adults as the control group (n = 50)

# Age

Table 1 shows no statistically significant difference in mean age between the control group and the group with inflammatory bowel disease. Patients with inflammatory bowel disease showed the following age distributions in terms of frequency: Figure 1 shows that there were ten patients aged 15–24 (representing 20%), 16 aged 25–34 (32%), 13 aged 35–44 (26%), six aged 45–54 (10%), and five aged 55 and above (10%).

# Gender

Table 2 reveals that males were more likely to have inflammatory bowel disease than women were; the

Table 1: Age of studied groups					
	Control ( $n = 50$ ) Means $\pm$ SD	IBD patients ( $n = 50$ ) Means $\pm$ SD	P Value		
Age (years)	$35.06 \pm 12.34$	39.32±11.63	NS		
Range	15-59	15-55			
SD = standa	rd deviation $NS = nc$	onsignificant at $P > 0.05$			



Figure 1: Frequency distribution of inflammatory bowel disease patients according to age

Table 2: Distribution of sex according to the studied group					
Sex	Control $(n = 50)$	IBD patients ( $n = 50$ )			
Female <i>n</i> (%)	20 (40%)	23 (46%)			
Male <i>n</i> (%)	30 (60%)	27 (54%)			

research included 50 patients with inflammatory bowel disease, 27 (54%) of whom were men and 23 (46%) of whom were women [Figure 2].

Association of Galectin-3 level with iron and vitamin E of inflammatory bowel disease patients.

Mean differences between IBD patients and controls are seen in Table 3, with IBD patients having higher Gal-3 concentrations and controls having lower iron and vitamin E concentrations.

Conversely, the present investigation found a significant (P = 0.05) inverse association between Gal-3 and iron and a non-significant (P > 0.05) inverse correlation between Gal-3 and vitamin E in patients with inflammatory bowel disease (IBD), as shown in Figures 3 and 4.

# DISCUSSION

Many studies have looked at the predictive usefulness of gal-3 in IBD since galectin-3 can be employed as a prognostic biomarker for a wide range of diseases.

The presence of galectins in serum was proposed as a potential illness biomarker by Johannes *et al.*,<sup>[12]</sup> who hypothesized that galectins leaked from tissue. By their findings, Frol'ova *et al.*<sup>[13]</sup> found that plasma Gal- 3



Figure 2: Percentage of women to men among those with IBD

activity was significantly higher in IBD patients than in controls.

IBD patients, healthy controls, and those with CD and UC all showed similar levels of Gal-3 expression, as shown by research by Papa Gobbi *et al.*<sup>[14]</sup>

Different suppliers of commercial ELISA kits used to assess Gal-3<sup>[15]</sup> may account for this variation, as may variances in variables that impacted the levels of Gal-3, such as age, renal function, and concurrent illnesses.

The biochemical activities occurring inside human cells depend on iron's presence. Iron homeostasis is highly controlled since iron shortage, and excess is severe and deadly health concerns. Disruption of this control results in cellular toxicity, tissue damage, and organ fibrosis. Iron accumulates in the parenchymal cells of many essential organs, including the heart, pancreas, and liver, mediating these negative consequences.<sup>[16]</sup>

Iron deficiency, even without anemia, may be burdensome and worsen any underlying chronic condition, leading to increased morbidity and mortality, as noted by Cappellini *et al.*<sup>[17]</sup> Chronic inflammatory diseases often occur with iron deficiency.

Between 13% and 90% of people with IBD are iron deficient, depending on the study group and illness severity. Chronic inflammation, bowel resection (particularly in Crohn's disease), illness-triggered malnutrition, and (primarily chronic) blood loss all contribute to reduced gastrointestinal iron absorption, which leads to iron deficiency.<sup>[18]</sup>

All these factors account for the inverse relationship between galectin-3 and iron, consistent with earlier studies' results.<sup>[19,20]</sup>

Consistent with earlier research, the current study found that individuals with inflammatory bowel disease had deficient

Table 3: Mean difference of Galectin-3, iron, and vitamin E in IBD patients and control					
Parameters	Control ( $n = 50$ ) Means $\pm$ SD	IBD patients ( $n = 50$ ) Means $\pm$ SD	P value		
Galectin-3 pg/ml	$179.88 \pm 66.24$	245.52±39.7	< 0.05		
Iron µg/dl	$111.38 \pm 21.96$	$85.24 \pm 36.05$	< 0.05		
Vitamin E nmol/L	$48.44 \pm 0.95$	41.13±1.49	< 0.05		

SD = standard deviation; P < 0.05: significant



Figure 3: Correlation of galectin-3 with iron in IBD patients

levels of vitamin E. Bitiren, Melissa, *et al.*<sup>[21]</sup> found that low levels of vitamin E were linked to increased free radical generation and consequent macro- and micro-damage.

Inadequate food intake, diseases that promote fat malabsorption, and a rare hereditary variant of Vit. E insufficiency are the most prevalent cause of Vit. E deficiency in underdeveloped nations.<sup>[22]</sup>

These results were compatibel with those of earlier casecontrol studies conducted in Jordan and Iraq which discovered a protective effect of dietary Vit. E intake.<sup>[23-26]</sup>

# CONCLUSION

Galectin-3 levels are elevated in individuals with inflammatory bowel disease in Babylon province, suggesting a strong association between Galectin-3 and IBD.

### **Recommendations**

The correlation between Galectin-3 levels and the severity of inflammatory bowel disease needs further investigation.

Second, further research (a therapeutic trial) is needed to determine whether or whether iron and vitamin E supplements are helpful in the management of inflammatory bowel illnesses.



Figure 4: Correlation of galectin-3 with vitamin E in IBD patients

# **Financial support and sponsorship** Nil.

### **Conflicts of interest**

There are no conflicts of interest.

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