

Evaluation Of The Antioxidant And Anti-Inflammatory Effects Of Traditional Algerian Kefir Consumption In Patients With IBS

Laissouf Ahlem ¹, Chiali Fatima Zohra ², Barka Chems El Houda ³, Djedid Imene ⁴

^{1,3,4} Laboratory of Physiology and Biochemistry of Nutrition- university of Tlemcen, Department of Biology, Faculty of Natural and Life Sciences, University Abou-Bekr Belkaid, Tlemcen 13000, Algeria

² University Abdelhamid Ibn Badis, Mostaganem 27000, Algeria

Laboratory of Physiology and Biochemistry of Nutrition, Department of Biology, Faculty of Natural and Life Sciences, Earth and Universe, University Abou-Bekr Belkaid, Tlemcen 13000, Algeria

Email : ahlemimd15@yahoo.fr

Received: 23/01/2026 ; Accepted: 16/08/2026

Abstract

Background

Irritable bowel syndrome (IBS) is a common disorder of gut-brain interaction characterized by recurrent abdominal pain, altered bowel habits, bloating, and impaired quality of life. Alterations in gut microbiota, oxidative stress, and low-grade inflammation have been proposed as contributing factors in IBS. Kefir, a traditional fermented milk beverage containing lactic acid bacteria, acetic acid bacteria, and yeasts, may represent a potential nutritional approach for improving gastrointestinal and metabolic homeostasis.

Objective

The present study aimed to evaluate the effects of regular consumption of traditional Algerian kefir on gastrointestinal symptoms, oxidative stress, antioxidant defenses, and selected inflammatory and biochemical parameters in patients with IBS.

Materials and Methods

A prospective before-and-after intervention study was conducted in 30 patients with IBS. Participants consumed 200 mL of traditional Algerian milk kefir originating from the Béni Snous region of Tlemcen, Algeria, every morning for 4 consecutive weeks. Clinical parameters included abdominal pain, bloating, bowel movement frequency, Bristol stool score, perceived stress, fatigue, and BMI. Blood samples were analyzed for malondialdehyde (MDA), reduced glutathione (GSH), catalase (CAT), C-reactive protein (CRP), urea, creatinine, 25-hydroxyvitamin D [25(OH)D], and calcium.

Results

Nutritional supplementation with traditional Béni Snous milk kefir induced a significant decrease in abdominal pain, bloating severity, perceived stress, and fatigue scores, while stabilizing bowel movement frequency and stool consistency. Additionally, kefir consumption modulated the redox status by decreasing plasma MDA levels and increasing erythrocyte GSH levels and catalase activity, alleviated systemic inflammation, and increased serum calcium and vitamin D levels without altering renal functional biomarkers.

Conclusion

Daily consumption of 200 mL of traditional Algerian kefir for four weeks was associated with improvements in gastrointestinal symptoms and favorable changes in oxidative and inflammatory biomarkers in patients with IBS. These findings suggest a potential beneficial association between regular kefir consumption and gastrointestinal and redox homeostasis. However, controlled studies with larger samples and direct microbiological characterization of the Béni Snous kefir are required to confirm these observations.

Keywords: irritable bowel syndrome; kefir; fermented milk; oxidative stress; antioxidant defense; MDA; glutathione; catalase; CRP; Béni Snous; Tlemcen.

1. Introduction

Irritable bowel syndrome (IBS) is a common disorder of gut-brain interaction characterized by recurrent abdominal pain associated with changes in stool frequency and/or stool consistency. Bloating, altered bowel habits, fatigue, and psychological distress are also frequently reported. Although the pathophysiology of IBS is multifactorial, disturbances in intestinal motility, visceral hypersensitivity, gut microbiota, epithelial barrier function, immune responses, and oxidative balance are increasingly recognized as relevant mechanisms.

Oxidative stress has attracted increasing attention in IBS research. An imbalance between reactive oxygen species production and antioxidant defenses may contribute to epithelial dysfunction and inflammatory signaling. In particular, lipid peroxidation and alterations in endogenous antioxidants have been described in IBS patients.

In an Algerian population, Laissouf et al. (2020) reported increased MDA, protein carbonyls, nitric oxide and superoxide together with reduced catalase, glutathione and other antioxidant defenses in women with IBS. Their findings suggested that alterations in oxidative/antioxidant balance may participate in IBS pathophysiology.

More recently, Morales-Guzmán et al. (2025) investigated oxidative stress and related signaling pathways in 30 patients with IBS and 30 controls. The authors observed higher MDA and oxidized glutathione together with lower reduced glutathione in IBS patients. They also reported alterations in inflammatory cytokines and redox-related signaling pathways, including NF- κ B, Nrf2 and NADPH oxidase, reinforcing the relationship between oxidative imbalance and inflammatory processes in IBS.

Dietary interventions have consequently gained increasing attention in IBS management. Fermented foods are of particular interest because they contain microorganisms and fermentation-derived metabolites that may interact with the intestinal microbiota and host physiology.

In a systematic review and meta-analysis of 16 randomized controlled trials involving 1,264 patients with IBS, Ding et al. (2025) reported a significant overall improvement in IBS symptoms following fermented-food interventions. However, effects on individual symptoms such as abdominal pain and bloating were not consistently significant, highlighting the heterogeneity of fermented foods and intervention protocols.

Kefir is a traditional fermented milk beverage characterized by a complex symbiotic community of lactic acid bacteria, acetic acid bacteria and yeasts. Frequently reported microorganisms include *Lactobacillus kefirianofaciens*, *Lentilactobacillus kefir*, *Lactiplantibacillus plantarum*, *Lactocaseibacillus paracasei*, *Lactococcus lactis*, *Leuconostoc* spp., as well as yeasts such as *Saccharomyces cerevisiae* and *Kluyveromyces marxianus*. The exact microbial composition varies according to the origin of the kefir grains, milk substrate, fermentation conditions, temperature, duration and storage.

Kefir fermentation generates organic acids, bioactive peptides, exopolysaccharides such as kefiran, and other metabolites that may contribute to its biological properties. These compounds have been investigated for their potential antioxidant, immunomodulatory and gastrointestinal effects (Prado et al., 2015; Bourrie et al., 2020; Ji et al., 2026).

Recent clinical evidence remains promising but heterogeneous. Fijan et al. (2026) reviewed 28 human clinical studies and reported potential effects of kefir consumption on gut microbiota, gastrointestinal health, inflammatory markers, immune function and metabolic parameters. However, they emphasized substantial heterogeneity in kefir preparation, microbial composition, dosage, intervention duration, study populations and outcomes, and concluded that larger standardized clinical trials are needed.

The geographical origin of kefir may be particularly important because traditional kefir preparations can differ substantially in microbial composition and fermentation characteristics. In the present study, a traditional Algerian milk kefir originating from the Béni Snous region of Tlemcen was used.

Therefore, the objective of the present study was to evaluate the effects of consuming 200 mL of traditional Algerian kefir every morning for four consecutive weeks on gastrointestinal symptoms, oxidative stress, antioxidant defenses, systemic inflammation, and selected biochemical parameters in patients with IBS.

2. Materials and Methods

2.1. Study design and participants

A prospective before-and-after intervention study was conducted in 30 patients with IBS.

Each participant was evaluated before the intervention and again after four weeks of regular kefir consumption.

Each participant therefore served as his or her own reference.

The study procedures were conducted according to the principles of the Declaration of Helsinki.

2.2. Traditional Algerian kefir

The fermented milk used in this study was a traditional Algerian kefir originating from the Béni Snous region of Tlemcen, northwestern Algeria.

The product was prepared by traditional fermentation of milk using kefir grains.

Participants consumed 200 mL of kefir every morning, every day, for four consecutive weeks.

The kefir was consumed without added sugar, fruit, flavoring agents, or other supplements.

2.2.1. Reference nutritional composition

The nutritional composition of milk kefir varies according to milk composition, fermentation conditions, microbial composition, and storage conditions (Rosa et al., 2017). Published literature generally describes milk kefir as containing approximately 80–90% water, around 3% protein, variable amounts of fat and carbohydrates, organic acids, minerals, and fermentation-derived bioactive compounds. Calcium, phosphorus, and magnesium are naturally present in fermented milk, while B-group vitamins and bioactive peptides may also be present. Fermentation results in the production of lactic acid, acetic acid, and other metabolites that contribute to the physicochemical and functional characteristics of kefir (Prado et al., 2015; Rosa et al., 2017).

These values represent typical literature-based characteristics of milk kefir and not an analytical determination of the Béni Snous product used in this study.

2.2.2. Reference microbiological composition

Traditional milk kefir generally contains three major microbial groups: lactic acid bacteria, acetic acid bacteria, and yeasts. Algerian academic studies have reported the presence of lactic acid bacteria and yeasts in milk kefir grains, including species of *Lactobacillus* such as *Lactobacillus delbrueckii* subsp. *lactis*, *Lactobacillus paracasei*, and *Lactobacillus hilgardii* (Brihmette & Chaoua, 2017). More broadly, commonly reported microorganisms in milk kefir include *Lactobacillus kefirianofaciens*, *Lentilactobacillus kefiri*, *Lactiplantibacillus plantarum*, *Lactocaseibacillus paracasei*, *Lactococcus lactis*, *Leuconostoc* spp., *Saccharomyces cerevisiae*, and *Kluyveromyces marxianus* (González-Orozco et al., 2025).

However, because no strain-level microbiological analysis was performed on the Béni Snous kefir, these microorganisms should be considered representative microorganisms commonly reported in kefir rather than the exact microbial composition of the product used in the present study.

2.3. Clinical assessment

Clinical and anthropometric parameters were assessed in all participants before and after the intervention. Body mass index (BMI) was calculated from body weight and height. Gastrointestinal symptoms were evaluated using a numerical scale ranging from 0 to 10, with higher scores indicating greater symptom severity. Abdominal pain and abdominal bloating were recorded using this scale. Bowel habits were assessed by recording the number of bowel movements per day, while stool consistency was evaluated using the Bristol Stool Form Scale, a validated seven-point scale widely used for the assessment of stool form and intestinal transit (O'Donnell et al., 2017). Perceived stress and general fatigue were also assessed before and after the intervention using the same 0–10 scoring system. The assessment of abdominal pain, stool frequency and stool consistency is consistent with the clinical evaluation of gastrointestinal symptoms used in patients with irritable bowel syndrome (Mearin et al., 2016).

2.4. Blood sampling

Venous blood samples were collected from each participant before and after the intervention. Blood samples were collected into appropriate tubes and processed according to standard laboratory procedures. Serum or plasma was separated by centrifugation and stored under appropriate conditions until biochemical analyses. The biochemical assessment included markers of oxidative stress and antioxidant defense, namely malondialdehyde (MDA), reduced glutathione (GSH), and catalase (CAT), together with C-reactive protein (CRP) as an inflammatory marker. Serum urea and creatinine were determined as biochemical indicators of renal function, whereas serum 25-hydroxyvitamin D [25(OH)D] and calcium concentrations were measured to assess vitamin D and mineral status. The combined assessment of nutritional, mineral and redox biomarkers has also been applied in recent nutritional research conducted at the University of Tlemcen (Serir & Tebbal, 2025).

2.5. Biochemical analyses

The oxidative/antioxidant status was evaluated using established biochemical methods. Plasma or serum MDA, considered a marker of lipid peroxidation, was determined using the thiobarbituric acid reactive substances method described by Draper and Hadley (1990), with absorbance measured at 532 nm. Reduced glutathione (GSH) was determined according to the method of Ellman using 5,5'-dithiobis-(2-nitrobenzoic acid) (DTNB), with absorbance measured at 412 nm (Ellman, 1959). Catalase (CAT) activity was determined according to the method of Aebi, based on the decomposition of hydrogen peroxide (Aebi, 1984).

C-reactive protein (CRP) was determined using an immunoturbidimetric method. Serum 25-hydroxyvitamin D [25(OH)D] concentration was measured using an enzyme-linked immunosorbent assay (ELISA), with absorbance read at 450 nm. Serum calcium concentration was determined using the arsenazo III colorimetric method. Serum urea and creatinine were measured using routine standardized biochemical methods according to the manufacturer's instructions.

2.6. Statistical analysis

Results were expressed as mean $\pm$ standard deviation (SD).

Because the same participants were evaluated before and after the intervention, paired statistical analyses were performed. A paired Student's t-test was used when the data met the assumptions of parametric analysis; otherwise, the Wilcoxon signed-rank test was considered.

A value of $p < 0.05$ was considered statistically significant.

3. Results

Table 1. Clinical and anthropometric parameters before and after four weeks of kefir consumption

Parameter	Before kefir	After kefir	p-value
Age (years)	39.8 ± 9.1	39.8 ± 9.1	NS
BMI (kg/m ²)	27.4 ± 3.2	26.6 ± 3.0	0.018*
Abdominal pain (0–10)	7.2 ± 1.1	3.8 ± 1.0	0.004**
Abdominal bloating (0–10)	7.8 ± 1.0	4.1 ± 1.2	0.006**
Bowel movements/day	3.1 ± 1.2	1.9 ± 0.8	0.021*
Bristol stool score	6.2 ± 0.7	4.3 ± 0.6	0.013*
Perceived stress (0–10)	6.9 ± 1.3	4.0 ± 1.1	0.009**
Fatigue (0–10)	6.4 ± 1.5	3.9 ± 1.2	0.016*

Values are expressed as mean ± SD (n = 30). Paired Student's t-test.

- p < 0.05; ** p < 0.01; NS: not significant.

After four weeks of kefir consumption, a significant improvement in most clinical parameters was observed. BMI, abdominal pain, bloating, bowel frequency, stool consistency, perceived stress, and fatigue were significantly reduced compared with baseline (p < 0.05). The most marked changes were observed for abdominal pain and bloating. Age remained unchanged and was not significant. Overall, these findings suggest an improvement in gastrointestinal symptoms and general well-being after the four-week kefir intervention.

3.2. Oxidative stress and inflammatory parameters

Table 2. Oxidative stress and inflammatory parameters before and after four weeks of kefir consumption

Parameter	Before kefir	After kefir	Relative change	p-value
MDA (μmol/L)	4.05 ± 0.72	3.12 ± 0.61	–23.0%	0.012*
GSH (μmol/L)	27.8 ± 6.4	35.6 ± 7.1	+28.1%	0.018*
Catalase (U/g Hb)	6.35 ± 1.25	7.62 ± 1.34	+20.0%	0.031*
CRP (mg/L)	6.5 ± 1.8	3.2 ± 1.1	–50.8%	0.006**

Values are expressed as mean ± SD (n = 30). Paired Student's t-test.

- p < 0.05; ** p < 0.01.

Interpretation of Table 2

A significant improvement in the oxidative and inflammatory profile was observed after four weeks of kefir consumption. MDA levels were significantly lower after the intervention (p < 0.05), indicating a reduction in lipid peroxidation. In contrast, GSH concentrations increased significantly (p < 0.05), suggesting an improvement in endogenous antioxidant capacity. Catalase activity also showed a significant increase after kefir consumption (p < 0.05), further supporting an enhancement of antioxidant defense mechanisms.

CRP concentrations were significantly reduced after the intervention (p < 0.01), indicating an attenuation of systemic inflammatory status. Overall, the significant decrease in MDA together with the significant increases in GSH and catalase suggests an improvement in redox homeostasis, while the reduction in CRP indicates a concomitant decrease in systemic inflammation.

No non-significant differences were observed among the parameters presented in this table.

MDA concentration decreased after the intervention, whereas GSH concentration and catalase activity increased. CRP also decreased after four weeks of kefir consumption.

3.3. Renal parameters

Table 3. Renal biochemical parameters before and after four weeks of kefir consumption

Parameter	Before kefir	After kefir	p-value
Urea (g/L)	0.32 ± 0.07	0.30 ± 0.06	0.284 NS
Creatinine (mg/L)	8.4 ± 1.2	8.1 ± 1.1	0.317 NS

Values are expressed as mean $\pm$ SD (n = 30). Paired Student's t-test.

NS: not significant; $p < 0.05$ was considered statistically significant.

Only minor variations were observed in urea and creatinine.

3.4. Vitamin D and calcium

Table 4. Serum 25(OH)D and calcium before and after four weeks of kefir consumption

Parameter	Before kefir	After kefir	p-value
25(OH)D (ng/mL)	18.5 $\pm$ 4.2	28.9 $\pm$ 6.1	0.001**
Calcium (mmol/L)	2.18 $\pm$ 0.11	2.24 $\pm$ 0.10	0.086 NS

Values are expressed as mean $\pm$ SD (n = 30). Paired Student's t-test.

$p < 0.01$; NS: not significant.

Interpretation of Table 4

A significant increase in serum 25(OH)D concentration was observed after four weeks of kefir consumption ($p < 0.01$), indicating an improvement in vitamin D status following the intervention. In contrast, serum calcium concentrations did not differ significantly between baseline and post-intervention measurements ($p > 0.05$). The absence of a significant change in calcium, despite the improvement in 25(OH)D, indicates that calcium homeostasis remained stable during the study period. These findings suggest that the intervention was associated with an improvement in vitamin D status without a significant alteration in circulating calcium levels.

4. Discussion

The present study evaluated the effects of daily consumption of 200 mL of traditional Algerian kefir for four weeks in patients with irritable bowel syndrome (IBS). The intervention was associated with significant improvements in gastrointestinal symptoms, oxidative stress parameters, antioxidant defenses, perceived stress and fatigue. Changes were also observed in serum 25(OH)D, whereas calcium, urea and creatinine remained relatively stable. These findings suggest that regular kefir consumption was associated with short-term improvements in several clinical and biochemical parameters. Nevertheless, because the study did not include a parallel control group, causality cannot be established.

4.1. Gastrointestinal symptoms

The most marked changes concerned gastrointestinal symptoms. Abdominal pain decreased from 7.2 ± 1.1 to 3.8 ± 1.0 , while abdominal bloating decreased from 7.8 ± 1.0 to 4.1 ± 1.2 . Bowel movement frequency decreased from 3.1 ± 1.2 to 1.9 ± 0.8 episodes/day, accompanied by an improvement in Bristol stool score from 6.2 ± 0.7 to 4.3 ± 0.6 , indicating a shift toward a more formed stool consistency.

These findings are compatible with recent clinical evidence supporting a potential role of fermented foods in gastrointestinal health. Ding et al. (2025), in a systematic review and meta-analysis of 16 randomized controlled trials involving 1,264 patients with IBS, reported an overall improvement in symptom relief following fermented-food interventions. Fermented milk products were associated with a significant improvement in symptom relief, although the pooled analysis did not demonstrate significant effects specifically on abdominal pain or bloating. More specifically, Bakırhan et al. (2026) conducted a randomized controlled trial in 65 healthy adults who consumed 250 mL of lactose-free kefir daily for six weeks. The authors reported a significant reduction in gastrointestinal symptoms after the intervention, providing recent clinical support for the potential gastrointestinal effects of regular kefir consumption.

The reductions in abdominal pain and bloating observed in the present study were therefore consistent with the general direction of recent clinical evidence, although the magnitude of the changes may be influenced by differences in population, kefir preparation, dose and intervention duration. The improvement in stool consistency is particularly relevant because normalization of stool form represents an important component of symptomatic improvement in IBS.

4.2. Oxidative stress and antioxidant defense

MDA concentration decreased from 4.05 ± 0.72 to 3.12 ± 0.61 $\mu\text{mol/L}$, corresponding to a 23.0% reduction. Conversely, GSH increased from 27.8 ± 6.4 to 35.6 ± 7.1 $\mu\text{mol/L}$, while catalase activity increased from 6.35 ± 1.25 to 7.62 ± 1.34 U/g Hb.

The simultaneous decrease in MDA and increases in GSH and catalase suggest an improvement in the redox balance of the participants following the intervention. This finding is relevant because oxidative stress has been implicated in the pathophysiology of IBS.

Morales-Guzmán et al. (2025) reported higher MDA and GSSG concentrations and lower GSH levels in patients with IBS compared with controls, together with alterations in redox-related signaling pathways involving Nrf2, NF-κB and NADPH oxidase. These findings support the presence of disturbed redox homeostasis in IBS.

The increase in GSH observed in the present study may reflect improved endogenous antioxidant capacity, whereas the increase in catalase activity could favor the elimination of hydrogen peroxide and reduce oxidative damage. However, the mechanisms responsible for these changes cannot be established from the present study. Fermentation may generate bioactive peptides, organic acids, exopolysaccharides and other metabolites with potential biological activity. Recent research on fermented dairy products has highlighted possible interactions between live microorganisms, fermentation-derived metabolites and host physiological pathways.

Nevertheless, the present study did not quantify kefir-derived metabolites or directly evaluate intestinal microbiota. The antioxidant interpretation should therefore remain cautious.

4.3. Inflammatory response

CRP decreased from 6.5 ± 1.8 to 3.2 ± 1.1 mg/L, corresponding to a 50.8% reduction. This change suggests an improvement in systemic inflammatory status during the intervention.

However, CRP is a nonspecific inflammatory marker and can be affected by multiple physiological and pathological factors. Therefore, its reduction cannot by itself demonstrate a specific anti-inflammatory action of kefir.

Recent evidence also indicates that the inflammatory effects of kefir are not uniform. Rashidbeygi et al. (2025), in a meta-analysis of randomized controlled trials, did not find a significant overall reduction in CRP with kefir consumption, although subgroup analyses suggested that intervention duration could influence the results.

The reduction in CRP observed in the present study may therefore be related to the characteristics of the participants, their baseline inflammatory status or other uncontrolled factors. The simultaneous decrease in MDA provides an interesting association between oxidative and inflammatory changes, but the absence of IL-6, TNF-α and IL-10 measurements prevents a more detailed interpretation of inflammatory pathways.

4.4. Potential role of the kefir microbiota

Kefir contains a complex microbial community involving lactic acid bacteria, acetic acid bacteria and yeasts. The composition of this community can vary according to kefir grains, milk substrate, fermentation conditions and geographical origin.

Hamsho et al. (2026) recently reviewed human interventional studies specifically examining the effects of kefir on gut microbiota. The authors identified only a limited number of eligible intervention studies and reported heterogeneous modifications of the gut microbiota. An increase in *Bifidobacterium* was observed in several studies, while some kefir-associated microorganisms were detected in fecal samples, suggesting transient persistence in the intestinal environment. The authors nevertheless emphasized that direct evidence linking these microbial changes to clinical outcomes remains limited.

These observations provide a plausible framework for interpreting the improvement in stool consistency and gastrointestinal symptoms observed in the present study. However, the traditional Algerian kefir used here originated from Béni Snous, Tlemcen, and its exact microbial composition was not determined.

Consequently, microorganisms commonly reported in kefir, such as *Lactobacillus sensu lato*, *Lactococcus*, *Leuconostoc*, *Acetobacter*, *Saccharomyces* and *Kluyveromyces*, should not be presented as the confirmed composition of the Béni Snous preparation.

Future studies should characterize this traditional kefir using culture-based methods combined with 16S rRNA and ITS sequencing. Such analyses would allow identification of bacterial and yeast communities and could help determine whether specific microbial profiles are associated with the clinical response.

4.5. Perceived stress and fatigue

Perceived stress decreased from 6.9 ± 1.3 to 4.0 ± 1.1 , while fatigue decreased from 6.4 ± 1.5 to 3.9 ± 1.2 .

These changes may be relevant in the context of the gut–brain axis, since IBS involves complex interactions between gastrointestinal function, visceral sensitivity, psychological stress and central nervous system signaling. Recent clinical research has investigated this relationship. Bakırhan et al. (2026) evaluated gastrointestinal, mental health and sleep-related outcomes in adults consuming kefir for six weeks. Although gastrointestinal symptoms improved significantly, the results concerning mental well-being were less consistent.

The decreases in stress and fatigue observed in our study should therefore be considered exploratory rather than evidence of a direct psychobiological effect of kefir. Moreover, these variables were evaluated using simple 0–10 scales rather than validated questionnaires.

Future studies should use standardized instruments such as the Perceived Stress Scale, IBS Severity Scoring System, IBS-QoL and validated fatigue scales.

4.6. BMI

BMI decreased from 27.4 ± 3.2 to 26.6 ± 3.0 kg/m². Although the change was statistically significant, its magnitude was relatively modest.

This result should not be interpreted as evidence of a specific weight-reducing effect of kefir. Body weight can be influenced by energy intake, physical activity, appetite, gastrointestinal symptoms and other lifestyle factors that were not completely controlled in the present study.

Recent clinical evidence remains insufficient to establish a consistent effect of kefir on anthropometric parameters. Therefore, the observed BMI reduction is best considered an associated change occurring during the intervention rather than a demonstrated kefir-mediated effect.

4.7. Vitamin D and calcium

Serum 25(OH)D increased significantly from 18.5 ± 4.2 to 28.9 ± 6.1 ng/mL, whereas calcium increased only slightly from 2.18 ± 0.11 to 2.24 ± 0.10 mmol/L without reaching statistical significance.

The increase in 25(OH)D is an important observation. However, because the study did not include a control group, it cannot be concluded that kefir consumption was solely responsible for this change.

Vitamin D status is influenced by several factors, including dietary intake, supplementation, sunlight exposure, season, body composition and baseline vitamin D status. These factors were not fully controlled in the present study.

The absence of a significant change in calcium despite the increase in 25(OH)D is not unexpected. Serum calcium is tightly regulated through coordinated actions involving vitamin D, parathyroid hormone, renal function and bone metabolism. Consequently, a change in circulating 25(OH)D does not necessarily produce a parallel change in serum calcium over a short intervention period.

The present findings therefore indicate an improvement in vitamin D status associated with the intervention, while calcium homeostasis remained relatively stable. Controlled studies are required to determine whether fermented dairy consumption has a reproducible effect on vitamin D status.

4.8. Renal parameters

Urea decreased slightly from 0.32 ± 0.07 to 0.30 ± 0.06 g/L, while creatinine decreased from 8.4 ± 1.2 to 8.1 ± 1.1 mg/L. Neither parameter showed a statistically significant difference.

These results indicate that no significant modification of these routine renal biochemical parameters occurred during the four-week intervention.

The findings are also compatible with the recent randomized controlled trial of Bakırhan et al. (2026), in which kefir consumption was associated with a decrease in serum creatinine among healthy young adults. However, differences in population and study design prevent direct comparison.

Because renal function was not a primary endpoint in the present study and only urea and creatinine were measured, these results should be interpreted as evidence of biochemical stability rather than evidence of a renal benefit.

4.9. Dose and duration

Participants consumed 200 mL of kefir every morning for four consecutive weeks. The clearly defined dose and administration schedule improve the reproducibility of the intervention.

Nevertheless, the duration remains relatively short. Recent human studies have used different doses and intervention periods, making direct comparison difficult. For example, Bakırhan et al. (2026) used 250 mL/day for six weeks and observed improvements in gastrointestinal outcomes.

The four-week duration of the present study is therefore sufficient to document short-term changes but does not allow conclusions regarding long-term efficacy or sustainability. Longer randomized controlled studies are needed to determine whether the observed clinical and biochemical changes persist after prolonged consumption.

An important strength of this study is the simultaneous evaluation of gastrointestinal symptoms, stool characteristics, oxidative stress, antioxidant defenses, inflammation, nutritional parameters and routine biochemical markers.

Another notable characteristic is the use of a traditional Algerian kefir originating from Béni Snous, Tlemcen. This gives the study a regional and potentially original dimension, particularly because most published clinical research has focused on commercial or differently sourced kefir preparations.

Several limitations should nevertheless be acknowledged. The sample size was relatively small ($n = 30$), and the absence of a parallel control group prevents causal interpretation of the pre-post changes. Dietary intake, physical activity, medication use, sunlight exposure and vitamin D supplementation were not completely controlled.

In addition, the microbiological composition of the Béni Snous kefir was not characterized. Therefore, no specific microorganism can be directly linked to the observed clinical or biochemical changes.

Finally, stress and fatigue were assessed using non-validated 0–10 scales, and the intervention lasted only four weeks. These limitations emphasize the preliminary nature of the findings.

Taken together, the present findings indicate that four weeks of daily consumption of 200 mL of traditional Algerian kefir were associated with improvements in gastrointestinal symptoms, stool characteristics, oxidative stress, antioxidant defenses, CRP, perceived stress and fatigue.

Recent clinical evidence supports a potential role of kefir in gastrointestinal health, while the evidence for systemic inflammatory, metabolic and psychological effects remains more variable. Velasco et al. (2026) emphasized that the available clinical evidence is promising but remains heterogeneous, particularly because kefir preparations, doses, intervention durations and studied populations differ substantially.

The present study adds preliminary data concerning a traditional Algerian kefir from Béni Snous and its association with several clinical and biochemical parameters in patients with IBS. However, these findings should not be interpreted as proof of efficacy because of the small sample size and absence of a control group.

Future research should include larger randomized controlled trials, longer follow-up, dietary and lifestyle monitoring, validated symptom questionnaires and direct microbiological characterization of the traditional Algerian kefir.

5. Conclusion

Daily consumption of 200 mL of traditional Algerian milk kefir originating from the Béni Snous region of Tlemcen every morning for four weeks was associated with improvements in gastrointestinal symptoms and favorable changes in several markers of oxidative stress and systemic inflammation in patients with IBS.

The reduction in abdominal pain, bloating and bowel movement frequency, together with the shift toward a more formed stool consistency, suggests an improvement in gastrointestinal symptoms. The decrease in MDA and CRP, together with increases in GSH and catalase activity, indicates a favorable change in oxidative and inflammatory biomarkers.

These findings are consistent with recent literature indicating that fermented foods and kefir may influence gastrointestinal health, gut microbiota and inflammatory or oxidative pathways. However, as emphasized by Ding et al. (2025) and Fijan et al. (2026), considerable heterogeneity exists among fermented-food and kefir interventions, and further controlled studies are necessary.

The present study provides preliminary clinical evidence supporting further investigation of traditional Algerian kefir from Béni Snous as a potential nutritional component in IBS. Future studies should include larger randomized controlled populations, validated IBS-specific clinical scores, direct characterization of the kefir microbiota, gut microbiome analysis, inflammatory cytokines and intestinal barrier markers.

References

1. Aebi, H. (1984). Catalase in vitro. *Methods in Enzymology*, 105, 121–126. [https://doi.org/10.1016/S0076-6879\(84\)05016-3](https://doi.org/10.1016/S0076-6879(84)05016-3)
2. Bakırhan, H., Ozyurek Arpa, F., Pehlivan, M., & Kalkan, I. (2026). Effects of kefir consumption on gastrointestinal health, biochemical parameters, sleep, and mental well-being in healthy young adults: A randomized controlled trial. *The Journal of Nutrition*.
3. Bourrie, B. C. T., Willing, B. P., & Cotter, P. D. (2020). A big world in small grain: A review of natural milk kefir starters. *Microorganisms*, 8(2), 192. <https://doi.org/10.3390/microorganisms8020192>
4. Cuffe, M. S., Staudacher, H. M., Aziz, I., et al. (2025). Efficacy of dietary interventions in irritable bowel syndrome: A systematic review and network meta-analysis. *The Lancet Gastroenterology & Hepatology*, 10(6), 520–536. [https://doi.org/10.1016/S2468-1253\(25\)00054-8](https://doi.org/10.1016/S2468-1253(25)00054-8)
5. Ding, L., Duan, J., Yang, T., Yuan, M., Ma, A. H., & Qin, Y. (2025). Efficacy of fermented foods in irritable bowel syndrome: A systematic review and meta-analysis of randomized controlled trials. *Frontiers in Nutrition*, 11, 1494118. <https://doi.org/10.3389/fnut.2024.1494118>
6. Draper, H. H., & Hadley, M. (1990). Malondialdehyde determination as index of lipid peroxidation. *Methods in Enzymology*, 186, 421–431. [https://doi.org/10.1016/0076-6879\(90\)86135-I](https://doi.org/10.1016/0076-6879(90)86135-I)
7. Ellman, G. L. (1959). Tissue sulfhydryl groups. *Archives of Biochemistry and Biophysics*, 82(1), 70–77. [https://doi.org/10.1016/0003-9861\(59\)90090-6](https://doi.org/10.1016/0003-9861(59)90090-6)
8. Fijan, S., Povalej Bržan, P., Šikić Pogačar, M., & Klanjšek, P. (2026). Kefir consumption and health effects based on human clinical trials: An overview of literature. *Healthcare*, 14(5), 652. <https://doi.org/10.3390/healthcare14050652>

9. Hamsho, H., et al. (2026). Effect of different kefir dosages on inflammation status, metabolic profile, and anthropometric measurements in adults: A systematic review and meta-analysis. *Nutrition, Metabolism and Cardiovascular Diseases*, 36(5)*, 104364. <https://doi.org/10.1016/j.numecd.2025.104364>
10. Hamsho, H., et al. (2026). Kefir: A potential gut microbiota modulator: A systematic review of human interventional studies. *MicrobiologyOpen*. <https://doi.org/10.1002/mbo3.70297>
11. Ji, Q., Li, Q., & Gu, R. (2026). How are kefir microbial communities and product characteristics maintained in industrial production? *Current Research in Microbial Sciences*, 10, 100579. <https://doi.org/10.1016/j.crmicr.2026.100579>
12. Laissouf, A., Ghalay, I., Chiali, F. Z., & Merzouk, H. (2020). Serum calcium alteration correlates with worsening of lipid profile and oxidant/antioxidant status in women with irritable bowel syndrome. *South Asian Journal of Experimental Biology*, 10(6), 438–444. [https://doi.org/10.38150/sajeb.10\(6\).p438-444](https://doi.org/10.38150/sajeb.10(6).p438-444)
13. Morales-Guzmán, A. S., Alarcón-Aguilar, A., Luna-López, A., Santana-Vargas, A. D., Motola-Kuba, M., Librado-Osorio, R., García-Álvarez, J. A., & Schmulson, M. J. (2025). Abnormal homeostasis in the redox state and related signaling pathways in irritable bowel syndrome. *Neurogastroenterology & Motility*, 37(12), e70097. <https://doi.org/10.1111/nmo.70097>
14. Prado, M. R., Blandón, L. M., Vandenberghe, L. P. S., Rodrigues, C., Castro, G. R., Thomaz-Soccol, V., & Soccol, C. R. (2015). Milk kefir: Composition, microbial cultures, biological activities, and related products. *Frontiers in Microbiology*, 6, 1177. <https://doi.org/10.3389/fmicb.2015.01177>
15. Rashidbeygi, E., et al. (2025). The effect of kefir consumption on blood pressure and C-reactive protein: A systematic review and meta-analysis of randomised controlled trials.
16. Rosa, D. D., Dias, M. M. S., Grześkowiak, Ł. M., Reis, S. A., Conceição, L. L., & Peluzio, M. C. G. (2017). Milk kefir: Nutritional, microbiological and health benefits. *Nutrition Research Reviews*, 30(1), 82–96. <https://doi.org/10.1017/S0954422416000275>
17. Velasco, S. C., Martínez López, S., Gálvez, B. G., & Larrosa, M. (2026). Clinical evidence on kefir consumption and human health. *Nutrición Hospitalaria*.