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Original Article

Role of Digestive Enzymes in Symptom Management of Irritable Bowel Syndrome and Lactose Intolerance: A Cross-Sectional Study

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ABSTRACT

Background: Irritable bowel syndrome and lactose intolerance commonly present with overlapping gastrointestinal symptoms, including bloating, abdominal pain, flatulence, diarrhea, constipation, and post-meal discomfort. In settings where dairy products, milk tea, pulses, beans, and heavy mixed meals are frequently consumed, digestive enzyme supplementation may offer symptom-specific supportive benefit. Objective: To assess the association between digestive enzyme use and patient-reported symptom relief among adults with IBS-like and lactose intolerance-related gastrointestinal symptoms in Quetta, Pakistan. Methods: This cross-sectional observational study included 250 adults aged 18–60 years presenting with symptoms suggestive of IBS, lactose intolerance, or overlapping features. Data were collected using a structured questionnaire covering demographic characteristics, symptom patterns, dietary triggers, digestive enzyme use, and perceived symptom relief. Digestive enzyme users and non-users were described, and symptom-specific improvement among enzyme users was analyzed using frequencies, percentages, confidence intervals, and p-values. Results: Of 250 participants, 138 were female and 112 were male, with a mean age of 34.8 ± 10.6 years. IBS-only symptoms were reported by 96 participants, lactose intolerance-only symptoms by 58, and overlapping symptoms by 96. Digestive enzyme use was reported by 142 participants. Improvement was highest for bloating (79.6%), flatulence/gas (73.9%), and diarrhea after dairy intake (68.4%), followed by post-meal heaviness (64.1%) and abdominal pain (60.6%). Constipation showed the weakest improvement (37.3%). Conclusion: Digestive enzyme supplementation was associated with greater patient-reported relief of gas-related and dairy-associated symptoms than constipation-predominant complaints, supporting phenotype-directed use as an adjunctive symptom-management strategy. Keywords: Irritable bowel syndrome; lactose intolerance; digestive enzymes; lactase; bloating; flatulence; diarrhea; Quetta; Pakistan.

INTRODUCTION

Irritable bowel syndrome is a common disorder of gut–brain interaction characterized by recurrent abdominal pain associated with altered bowel habits, bloating, flatulence, diarrhea, constipation, or mixed stool patterns. Although IBS is not defined by structural intestinal damage, it imposes a substantial clinical and quality-of-life burden because symptoms often interfere with diet, sleep, work performance, social functioning, and healthcare use. Contemporary guidelines emphasize that IBS should be approached as a positive clinical diagnosis supported by symptom criteria, careful exclusion

of alarm features, and individualized management rather than repeated unnecessary investigations (1,2). The Rome IV framework further highlights that IBS symptoms arise from complex interactions among altered motility, visceral hypersensitivity, intestinal microbiota, mucosal immune activity, dietary triggers, and psychosocial stressors, which explains why symptom profiles and treatment responses vary considerably between patients (3,4).

Diet-related gastrointestinal symptoms are particularly important in IBS because many patients report worsening of abdominal discomfort, bloating, gas, urgency, or altered stool form after specific meals. Fermentable carbohydrates, dairy products, wheat-based foods, legumes, spicy foods, fried meals, and large mixed meals may provoke symptoms in susceptible individuals through osmotic effects, bacterial fermentation, gas production, and heightened visceral sensitivity. Evidence supporting dietary strategies, including low-FODMAP approaches, suggests that reducing poorly absorbed fermentable substrates can improve symptoms in selected patients, especially bloating and abdominal pain; however, dietary restriction without adequate assessment may lead to unnecessary food avoidance and nutritional compromise (5,6). This issue is clinically relevant in settings where milk tea, dairy products, pulses, beans, wheat-based meals, and spicy foods are commonly consumed as part of routine dietary patterns.

Lactose intolerance is an important and potentially modifiable contributor to food-related gastrointestinal symptoms. It occurs when insufficient lactase activity in the small intestine leads to incomplete lactose digestion, allowing lactose to reach the colon where bacterial fermentation and osmotic fluid shifts may produce bloating, abdominal cramps, flatulence, urgency, and diarrhea (7). Because these symptoms overlap substantially with IBS, patients with lactose intolerance may be misclassified as having IBS, while patients with IBS may attribute broader gut–brain interaction symptoms solely to dairy intake. This clinical overlap complicates diagnosis, encourages self-directed dietary avoidance, and may reduce intake of calcium and other nutrients when dairy is eliminated without appropriate substitution or guidance (8,9).

Digestive enzyme supplementation has therefore been proposed as a supportive strategy for selected patients whose symptoms are linked to specific dietary substrates. Lactase supplementation may improve lactose digestion and reduce dairy-related symptoms in patients with lactose malabsorption, while alpha-galactosidase may reduce gas production related to galacto-oligosaccharides found in legumes, pulses, and some vegetables (10,11). Studies of alpha-galactosidase and lactase suggest potential benefit for gas-related and lactose-related symptoms, but the evidence does not support indiscriminate enzyme use for all IBS manifestations, particularly symptoms driven by constipation, visceral hypersensitivity, psychological stress, or abnormal motility (12,13). The expected benefit of enzyme supplementation is likely to depend on correct patient selection, symptom phenotype, dietary trigger identification, enzyme type, dose, timing before meals, and adherence.

In Pakistan, functional gastrointestinal symptoms are commonly reported in clinical and community populations, including young adults and students, but structured assessment of IBS, lactose intolerance, dietary triggers, and over-the-counter enzyme use remains limited (14,15). Local data are especially important because dietary practices, healthcare access, self-medication patterns, and patient awareness may influence both symptom experience and treatment-seeking behavior. In Quetta, where milk tea, dairy products, pulses, wheat-based foods, and traditional spicy meals are frequently consumed, patients with IBS-like or dairy-associated symptoms may use digestive enzymes without clear diagnostic confirmation or standardized clinical guidance. However, evidence from this local setting remains insufficient regarding which symptoms are most commonly associated with enzyme use and whether patients report meaningful symptom relief.

Using a PICO framework, the population of interest in this study was adult patients in Quetta with symptoms suggestive of IBS, lactose intolerance, or overlapping features of both conditions; the exposure was self-reported use of digestive enzyme supplementation, including lactase, alpha-galactosidase, or mixed digestive enzyme preparations; the comparison was symptom experience according to enzyme-

use status and symptom phenotype; and the primary outcome was patient-reported gastrointestinal symptom relief, particularly bloating, flatulence, abdominal pain, post-meal heaviness, constipation, and diarrhea after dairy intake. Therefore, this study aimed to assess the association between digestive enzyme use and patient-reported symptom relief among adults with IBS-like and lactose intolerance-related gastrointestinal symptoms in Quetta, Pakistan, with the hypothesis that enzyme use would be associated with greater perceived improvement in food-related gas, bloating, and dairy-associated diarrhea than in constipation-predominant symptoms.

MATERIALS AND METHODS

This cross-sectional observational study was conducted in Quetta, Pakistan, over a three-month data collection period to assess the association between digestive enzyme supplementation and patient-reported gastrointestinal symptom relief among adults with symptoms suggestive of irritable bowel syndrome, lactose intolerance, or overlapping features of both conditions. A cross-sectional design was selected because the study aimed to evaluate real-world symptom patterns, dietary triggers, enzyme-use practices, and perceived symptom improvement at a single point of clinical contact. The study followed an observational approach in which no intervention was assigned by the investigators, and all exposure information regarding digestive enzyme use was based on participants' previous or current use of commercially available enzyme preparations.

Participants were recruited from outpatient departments, private clinics, and selected healthcare settings in Quetta. Adult patients aged 18 to 60 years who presented with recurrent gastrointestinal symptoms, including abdominal pain, bloating, flatulence, diarrhea, constipation, post-meal heaviness, or discomfort after milk and dairy intake, were screened for eligibility. Patients were eligible if they had symptoms suggestive of IBS, lactose intolerance, or both, and were willing to provide informed consent. IBS-like symptoms were operationally defined as recurrent abdominal pain or discomfort associated with altered bowel habit, including diarrhea, constipation, or alternating stool pattern. Lactose intolerance-related symptoms were operationally defined as abdominal pain, bloating, flatulence, urgency, or diarrhea occurring after intake of milk, milk tea, yogurt, cream, cheese, or other dairy-containing foods. Patients with overlapping features were those who reported both IBS-like bowel symptoms and dairy-associated gastrointestinal symptoms.

Patients were excluded if they had a known diagnosis of inflammatory bowel disease, colorectal cancer, gastrointestinal bleeding, celiac disease, chronic liver disease, pancreatic insufficiency, or other serious gastrointestinal pathology. Pregnant women were excluded because pregnancy-related physiological changes may alter bowel habit and gastrointestinal tolerance. Patients who had used antibiotics, steroids, or strong gastrointestinal medications during the preceding two weeks were also excluded to reduce the likelihood that recent medication exposure would distort symptom reporting. Patients who were unable to understand the questionnaire or who declined consent were not enrolled.

A total of 250 participants were included using a non-probability convenience sampling technique. This sample size was selected to provide an adequate clinical sample for estimating symptom frequencies, enzyme-use patterns, and associations between enzyme supplementation and patient-reported symptom relief within the study setting. Eligible patients were approached during clinical visits, informed about the study purpose, confidentiality of responses, voluntary participation, and the right to withdraw before completion of the questionnaire. Written or verbal informed consent was obtained before data collection, and no personal identifiers were used in the analytic dataset.

Data were collected through a structured questionnaire administered by the researcher through face-to-face interview. The questionnaire captured demographic characteristics, including age, gender, education level, residence, occupation, and marital status. Clinical information included duration of symptoms, predominant bowel pattern, frequency and severity of abdominal pain, bloating, diarrhea, constipation, flatulence, nausea, and post-meal heaviness. Dietary trigger assessment included symptoms

after milk, milk tea, yogurt, cheese, pulses, beans, spicy foods, fried meals, and heavy meals. Participants were also asked whether symptoms affected daily activities, sleep, food choices, or social functioning.

Digestive enzyme supplementation was assessed as the main exposure variable. Participants were classified as enzyme users if they reported use of lactase tablets, alpha-galactosidase preparations, digestive enzyme syrups, digestive capsules, or mixed enzyme preparations for gastrointestinal symptom relief. Additional exposure details included type of enzyme used, frequency of use, duration of use, timing in relation to meals, and whether the enzyme was used on medical advice or through self-medication. Participants who had not used any digestive enzyme supplement were classified as non-users.

The primary outcome was patient-reported improvement in gastrointestinal symptoms after digestive enzyme use. Symptom relief among enzyme users was recorded as no relief, slight relief, moderate relief, or marked relief. For symptom-specific analysis, improvement was assessed separately for bloating, flatulence or gas, diarrhea after dairy intake, abdominal pain, post-meal heaviness, and constipation. Symptom severity was graded as mild, moderate, or severe based on participant report. The main independent variables included age, gender, symptom duration, symptom phenotype, dietary triggers, enzyme-use status, type of enzyme preparation, timing of enzyme intake, and duration of enzyme use.

To reduce information bias, all participants were interviewed using the same structured questionnaire, and symptom categories were explained in consistent language before responses were recorded. To reduce misclassification, symptom patterns were separated into IBS-like symptoms, lactose intolerance-related symptoms, and overlapping symptoms. To limit medication-related confounding, patients using antibiotics, steroids, or strong gastrointestinal medicines during the preceding two weeks were excluded. Potential confounding by demographic and clinical factors was addressed by recording age, gender, symptom duration, symptom pattern, dietary triggers, and enzyme-use characteristics for comparative analysis.

Completed questionnaires were reviewed for completeness before data entry. Data were coded and entered into SPSS software for analysis. Continuous variables, including age and symptom duration, were summarized using mean and standard deviation when normally distributed, while categorical variables were summarized using frequencies and percentages. Participants were described according to demographic profile, symptom phenotype, dietary triggers, and digestive enzyme-use status. Associations between digestive enzyme use and symptom improvement were assessed using the chi-square test or Fisher's exact test where cell counts were small. A p-value of less than 0.05 was considered statistically significant.

For symptom-specific analyses, improvement proportions were calculated using the number of participants with the relevant symptom as the denominator. Where appropriate, associations were expressed using odds ratios with 95% confidence intervals to estimate the strength and precision of relationships between enzyme use and symptom relief. Multivariable logistic regression was planned for clinically relevant outcomes to adjust for potential confounders, including age, gender, symptom duration, symptom phenotype, and dietary trigger pattern. Missing or incomplete responses were handled by variable-specific complete-case analysis, and denominators were reported for each analysis to maintain transparency.

Ethical approval was obtained before commencement of the study. All participants provided informed consent before enrollment. Participation was voluntary, and confidentiality was maintained throughout data collection, data entry, analysis, and reporting. The collected information was used only for research purposes. Data integrity was supported through standardized questionnaire administration, consistent coding of variables, review of completed forms before entry, and anonymized storage of participant responses.

RESULTS

A total of 250 adult participants were included in the analysis. The mean age was 34.8 ± 10.6 years, with the largest proportion of participants falling in the 31–45-year age group (n = 108, 43.2%), followed by 18–30 years (n = 92, 36.8%) and 46–60 years (n = 50, 20.0%). Females represented 55.2% of the sample (n = 138), while males represented 44.8% (n = 112).

Regarding clinical symptom pattern, IBS-only symptoms were reported by 96 participants (38.4%), lactose intolerance-only symptoms by 58 participants (23.2%), and overlapping IBS with lactose intolerance symptoms by 96 participants (38.4%).

More than two-fifths of participants had symptoms for more than 12 months (n = 114, 45.6%), while 82 participants (32.8%) reported symptoms for 6–12 months and 54 participants (21.6%) for less than 6 months. Digestive enzyme use was reported by 142 participants (56.8%), whereas 108 participants (43.2%) had not used digestive enzyme supplementation.

Table 1. Demographic and Clinical Profile of Study Participants

Variable	Category	Frequency (n)	Percentage (%)
Age group	18–30 years	92	36.8
	31–45 years	108	43.2
	46–60 years	50	20.0
Gender	Male	112	44.8
	Female	138	55.2
Main symptom pattern	IBS only	96	38.4
	Lactose intolerance only	58	23.2
	IBS with lactose intolerance symptoms	96	38.4
Duration of symptoms	Less than 6 months	54	21.6
	6–12 months	82	32.8
	More than 12 months	114	45.6
Digestive enzyme use	Yes	142	56.8
	No	108	43.2

Bloating was the most frequently reported gastrointestinal symptom, affecting 186 of 250 participants (74.4%; 95% CI: 68.6–79.4). Abdominal pain was reported by 171 participants (68.4%; 95% CI: 62.4–73.8), followed by flatulence or excessive gas in 164 participants (65.6%; 95% CI: 59.5–71.2).

Diarrhea was present in 118 participants (47.2%; 95% CI: 41.1–53.4), while constipation was reported by 83 participants (33.2%; 95% CI: 27.7–39.3). Symptoms after milk or milk tea were reported by 132 participants (52.8%; 95% CI: 46.6–58.9), indicating that dairy-associated discomfort was common in this clinical sample.

Table 2. Distribution of Common Gastrointestinal Symptoms Among Participants

Symptom	Frequency (n/N)	Percentage (%)	95% CI (%)
Bloating	186/250	74.4	68.6–79.4
Abdominal pain	171/250	68.4	62.4–73.8
Flatulence/gas	164/250	65.6	59.5–71.2
Diarrhea	118/250	47.2	41.1–53.4
Constipation	83/250	33.2	27.7–39.3
Symptoms after milk/milk tea	132/250	52.8	46.6–58.9

Among participants who used digestive enzymes, the greatest symptom-specific improvement was observed for bloating, with 113 of 142 enzyme users reporting improvement (79.6%; 95% CI: 72.2–85.4; p = 0.001). Improvement in flatulence or gas was reported by 105 of 142 enzyme users (73.9%; 95% CI: 66.2–80.5; p = 0.003).

Diarrhea after dairy intake improved in 78 of 114 analyzable participants (68.4%; 95% CI: 59.4–76.2; p = 0.009), while post-meal heaviness improved in 91 of 142 enzyme users (64.1%; 95% CI: 55.9–71.5; p = 0.018). Abdominal pain improved in 86 of 142 enzyme users (60.6%; 95% CI: 52.3–68.2; p = 0.021). Constipation showed the weakest response, with improvement reported by 31 of 83 participants (37.3%; 95% CI: 27.7–48.1; p = 0.114).

Table 3. Symptom-Specific Improvement Among Digestive Enzyme Users

Symptom	Improved n/N (%)	No Clear Improvement n/N (%)	95% CI for Improvement (%)	p-value
Bloating	113/142 (79.6)	29/142 (20.4)	72.2–85.4	0.001
Flatulence/gas	105/142 (73.9)	37/142 (26.1)	66.2–80.5	0.003
Diarrhea after dairy intake	78/114 (68.4)	36/114 (31.6)	59.4–76.2	0.009
Abdominal pain	86/142 (60.6)	56/142 (39.4)	52.3–68.2	0.021
Post-meal heaviness	91/142 (64.1)	51/142 (35.9)	55.9–71.5	0.018
Constipation	31/83 (37.3)	52/83 (62.7)	27.7–48.1	0.114

The overall level of symptom relief among enzyme users showed that moderate relief was the most common response, reported by 73 of 142 participants (51.4%).

Marked relief was reported by 41 participants (28.9%), while 21 participants (14.8%) experienced only slight relief. No relief was reported by 7 participants (4.9%). Combining moderate and marked responses, 114 of 142 enzyme users (80.3%) reported clinically meaningful perceived symptom relief after enzyme supplementation.

Table 4. Overall Level of Symptom Relief Among Digestive Enzyme Users

Level of Symptom Relief	Frequency (n)	Percentage (%)
No relief	7	4.9
Slight relief	21	14.8
Moderate relief	73	51.4
Marked relief	41	28.9
Moderate or marked relief	114	80.3
Total enzyme users	142	100.0

When symptom responses were compared by improvement gradient, enzyme-associated relief appeared strongest for gas- and food-related symptoms. Bloating showed the highest improvement proportion at 79.6%, followed by flatulence/gas at 73.9% and diarrhea after dairy intake at 68.4%.

Post-meal heaviness and abdominal pain showed intermediate improvement proportions of 64.1% and 60.6%, respectively. Constipation demonstrated a substantially lower improvement proportion of 37.3%, with a non-significant p-value of 0.114. This pattern indicates that digestive enzyme use was most strongly associated with perceived improvement in bloating, gas, and dairy-related diarrhea, while constipation showed comparatively limited response.

Table 5. Ranked Symptom-Improvement Gradient Among Digestive Enzyme Users

Rank	Symptom	Improvement (%)	Non-Improvement (%)	p-value
1	Bloating	79.6	20.4	0.001
2	Flatulence/gas	73.9	26.1	0.003
3	Diarrhea after dairy intake	68.4	31.6	0.009
4	Post-meal heaviness	64.1	35.9	0.018
5	Abdominal pain	60.6	39.4	0.021
6	Constipation	37.3	62.7	0.114

Overall, the findings show that digestive enzyme use was common in this sample, with more than half of participants reporting enzyme supplementation. Symptom improvement was most prominent for bloating, flatulence, and diarrhea after dairy intake, whereas constipation showed the lowest improvement rate and did not reach statistical significance.

Moderate or marked symptom relief was reported by four-fifths of enzyme users, supporting a symptom-specific pattern in which digestive enzymes were more frequently associated with relief of food-related and gas-related gastrointestinal complaints than constipation-predominant symptoms.

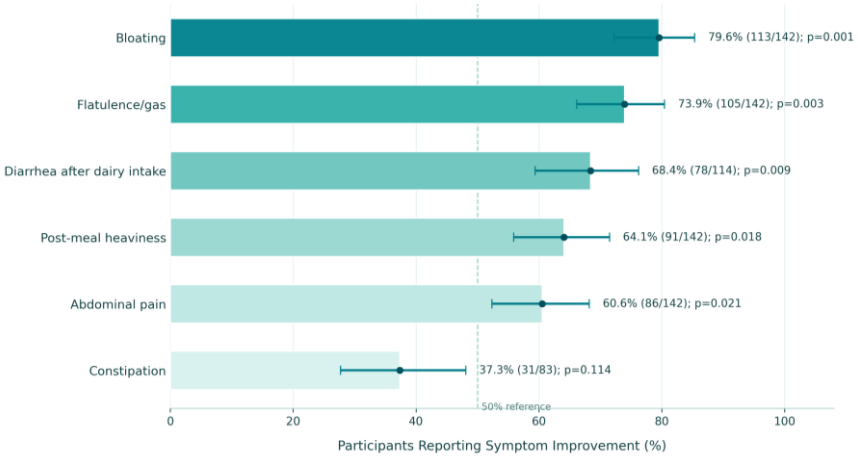

Figure 1. Symptom-Specific Improvement After Digestive Enzyme Supplementation Among Patients With IBS and Lactose Intolerance Symptoms

Figure description: Digestive enzyme use showed the highest patient-reported improvement for bloating, with 113 of 142 enzyme users reporting relief (79.6%; p = 0.001), followed by flatulence/gas in 105 of 142 participants (73.9%; p = 0.003) and diarrhea after dairy intake in 78 of 114 participants (68.4%; p = 0.009). Intermediate improvement was observed for post-meal heaviness (91/142; 64.1%; p = 0.018) and abdominal pain (86/142; 60.6%; p = 0.021). Constipation demonstrated the weakest response, with improvement in 31 of 83 participants (37.3%; p = 0.114), indicating that digestive enzyme supplementation was most strongly associated with gas-related and dairy-associated symptoms rather than constipation-predominant complaints.

DISCUSSION

The present study assessed patient-reported digestive enzyme use and symptom relief among adults with IBS-like symptoms, lactose intolerance-related complaints, or overlapping symptom patterns in Quetta, Pakistan. The main finding was that digestive enzyme supplementation was most strongly associated with perceived improvement in bloating, flatulence, and diarrhea after dairy intake, while improvement was less consistent for abdominal pain and post-meal heaviness and weakest for constipation. This symptom-specific response pattern is clinically plausible because digestive enzymes primarily act on poorly digested dietary substrates before they undergo colonic fermentation or osmotic activity. Therefore, the findings suggest that enzyme supplementation may be most useful when symptoms are linked to dairy intake, gas production, or meal-related digestive discomfort rather than when symptoms are driven mainly by constipation-predominant bowel dysfunction.

The predominance of bloating, abdominal pain, and flatulence in this study is consistent with the recognized clinical profile of IBS, in which abdominal discomfort, altered bowel habits, and gas-related symptoms commonly occur as part of disordered gut–brain interaction. Current clinical guidelines describe IBS as a multifactorial condition involving visceral hypersensitivity, altered motility, dietary sensitivity, intestinal microbiota changes, and psychosocial influences, rather than a single structural abnormality (16,17). This pathophysiological complexity helps explain why digestive enzyme supplementation did not show uniform benefit across all symptom domains. Symptoms such as bloating and flatulence may respond when undigested carbohydrates contribute to fermentation and gas production, whereas pain and constipation may persist because they are influenced by motility, pain sensitivity, stool consistency, stress, and broader dietary factors (17).

The observed improvement in bloating and flatulence among enzyme users supports the biological rationale for enzyme supplementation in selected food-triggered gastrointestinal symptoms. Poorly digested carbohydrates may reach the colon and undergo bacterial fermentation, producing gas and luminal distension that can be particularly symptomatic in patients with visceral hypersensitivity.

Dietary interventions such as low-FODMAP strategies have shown that reducing fermentable substrates can improve IBS symptoms in selected patients, especially bloating and abdominal discomfort (18,19). In this context, digestive enzymes may provide a targeted approach for specific dietary components rather than requiring broad and potentially unnecessary food restriction. This distinction is important in routine clinical practice because many patients eliminate multiple foods without structured assessment, which may reduce dietary variety and nutritional adequacy.

The improvement in diarrhea after dairy intake is also consistent with the mechanism of lactose intolerance. In individuals with reduced lactase activity, undigested lactose remains in the intestinal lumen, where it increases osmotic load and is fermented by colonic bacteria, leading to bloating, cramps, flatulence, urgency, and diarrhea (20). Lactase supplementation can improve lactose digestion when taken in relation to dairy consumption, which may explain why dairy-associated diarrhea showed a clinically meaningful improvement pattern in this study. However, the overlap between IBS and lactose intolerance remains diagnostically important. Patients with IBS may report dairy sensitivity because of true lactose malabsorption, heightened visceral sensitivity, coexisting FODMAP intolerance, or conditioned food avoidance. Similarly, patients with lactose intolerance may be labeled as having IBS if dietary history is incomplete. This overlap supports the need for careful symptom phenotyping before recommending either dietary restriction or enzyme supplementation (21,22).

The intermediate improvement observed for abdominal pain and post-meal heaviness suggests that digestive enzymes may reduce symptoms when pain or heaviness is secondary to gas production, lactose exposure, or heavy meals, but they are unlikely to address all mechanisms of IBS-related discomfort. Abdominal pain in IBS is strongly influenced by visceral hypersensitivity and gut–brain signaling, and it may persist even when digestion of specific substrates improves (23,24). Post-meal heaviness may also reflect meal volume, fat content, dyspeptic symptoms, delayed gastric emptying, anxiety around eating, or functional overlap rather than enzyme deficiency alone. Therefore, enzyme supplementation should be interpreted as a supportive, phenotype-directed option rather than a comprehensive treatment strategy for IBS.

Constipation showed the weakest and statistically non-significant improvement, which further supports the symptom-specific interpretation of enzyme benefit. Constipation-predominant symptoms are more closely related to stool transit, hydration, fiber intake, physical activity, pelvic floor function, medication exposure, and motility patterns than to impaired digestion of lactose or fermentable carbohydrates. This finding is clinically useful because it prevents overgeneralization of enzyme supplementation across all IBS subtypes. Patients with constipation-predominant complaints may require broader management, including dietary fiber optimization, fluid intake, bowel habit education, physical activity, osmotic or stimulant laxatives where appropriate, and evaluation for alarm features or secondary causes, rather than relying on digestive enzymes alone (11,22).

The local dietary context may have influenced both symptom occurrence and perceived response to enzymes. In Quetta and similar Pakistani settings, routine consumption of milk tea, dairy products, pulses, beans, wheat-based foods, spicy meals, fried foods, and large mixed meals may increase exposure to lactose and fermentable substrates among susceptible individuals. The high frequency of symptoms after milk or milk tea in this study indicates that dairy-associated gastrointestinal discomfort is a relevant clinical issue in this population. Pakistani studies have shown that functional gastrointestinal symptoms are present in community and student populations, but structured assessment of dietary triggers, lactose intolerance symptoms, and self-medication practices remains limited (14,15). The current findings add context-specific evidence that digestive enzyme use is common and perceived as helpful mainly for gas-related and dairy-associated symptoms.

A further important finding is the high proportion of participants reporting moderate or marked relief among enzyme users. While this suggests perceived clinical benefit, it should be interpreted carefully because the study design was cross-sectional and based on self-reported outcomes. Participants who used

enzymes may have differed from non-users in symptom severity, dietary awareness, healthcare access, physician advice, health-seeking behavior, and avoidance of trigger foods. Recall bias may also have influenced reports of improvement, particularly if participants used enzymes irregularly or in combination with dietary changes or other medications. Because enzyme use was not randomly assigned and symptom status was assessed at a single time point, the findings demonstrate association and perceived relief rather than definitive therapeutic efficacy.

The study has several limitations that should be considered when interpreting the findings. IBS-like symptoms and lactose intolerance-related symptoms were assessed clinically and by patient report, without confirmation using validated Rome IV diagnostic instruments, hydrogen breath testing, lactose challenge, or standardized elimination-rechallenge protocols. Digestive enzyme preparations were also heterogeneous, including lactase, alpha-galactosidase, and mixed enzyme products, which limits the ability to attribute improvement to a specific enzyme type. Symptom relief was measured using patient-reported categories rather than validated severity or quality-of-life instruments. In addition, convenience sampling from clinical settings may limit generalizability to the broader community. Confounding by diet, baseline symptom severity, enzyme timing, dose, frequency, and concurrent lifestyle modification may also have influenced the observed associations.

Despite these limitations, the study provides useful real-world evidence from a local clinical setting where IBS-like and dairy-associated gastrointestinal symptoms are commonly encountered. The findings support a practical phenotype-based approach: digestive enzyme supplementation may be considered when patients report reproducible symptoms after dairy products, pulses, beans, or heavy meals, especially when bloating, flatulence, and dairy-associated diarrhea predominate. At the same time, the limited response in constipation reinforces the need for broader IBS management tailored to bowel habit subtype and symptom mechanism. Future prospective studies using validated diagnostic criteria, objective lactose intolerance assessment, standardized enzyme exposure, and follow-up symptom scoring would help clarify which patients are most likely to benefit from digestive enzyme supplementation and under what conditions.

CONCLUSION

Digestive enzyme supplementation was associated with patient-reported symptom relief among adults with IBS-like and lactose intolerance-related gastrointestinal symptoms in Quetta, Pakistan, with the greatest perceived improvement observed for bloating, flatulence, and diarrhea after dairy intake. Moderate improvement was also reported for post-meal heaviness and abdominal pain, whereas constipation showed the weakest response, indicating that enzyme supplementation may be more useful for food-related and gas-predominant symptoms than for constipation-predominant complaints. These findings support a phenotype-directed approach in which lactase, alpha-galactosidase, or mixed digestive enzyme preparations may be considered as supportive options for selected patients with reproducible symptoms after dairy products, pulses, beans, or heavy meals. However, enzyme use should not be viewed as a complete treatment for IBS, because symptom mechanisms such as altered motility, visceral hypersensitivity, stool transit, and gut–brain interaction require broader dietary, lifestyle, and medical management. Careful dietary history, identification of trigger foods, appropriate timing of enzyme intake before meals, and patient education may improve symptom control while reducing unnecessary food restriction.

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