Milovac et al. Scr Med. 2026 May-Jun;57(3):607-12. DOI:10.5937/scriptamed57-66161

ORIGINAL ARTICLE

Phenotypic Characteristics of Patients With Irritable Bowel Syndrome: Association Between Gastrointestinal Symptoms and Psychological Factors – A Pilot Study

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Abstract

Background/Aim: Irritable bowel syndrome (IBS) is a heterogeneous functional gastrointestinal (GI) disorder frequently associated with psychological symptoms. Phenotypic characterisation of patients may improve understanding of the relationship between gastrointestinal and psychological dimensions. The aim of this pilot study was to describe gastrointestinal and psychological phenotypic features in IBS patients and to examine their interrelationships.

Methods: The study included 20 IBS patients (8 IBS-D, 7 IBS-M, 5 IBS-C) and 9 healthy controls. Gastrointestinal symptoms were assessed using the GSRS and VSI questionnaires, while psychological status was evaluated with the PHQ-15 and HADS. Groups were compared using independent samples t-tests and correlations within the IBS group were analysed using Spearman's correlation. Statistical analysis was performed using SPSS.

Results: IBS patients demonstrated significantly more severe GI symptoms and higher somatic symptom perception compared to controls ($p < 0.01$). Within the IBS group, strong correlations were observed between VSI and PHQ-15 ($p = 0.740$, $p < 0.001$) and between GSRS and PHQ-15 ($p = 0.605$, $p = 0.001$). Associations between HADS and GI symptoms were weaker; the correlation with GSRS was not statistically significant ($p = 0.333$, $p = 0.078$), while the correlation with VSI reached statistical significance ($p = 0.484$, $p = 0.008$).

Conclusion: Gastrointestinal symptoms in IBS patients are strongly associated with somatic symptom perception, whereas associations with general anxiety and depression are weaker. These findings support the heterogeneity of the IBS phenotype and highlight the importance of individualised assessment of gastrointestinal and psychological dimensions in clinical practice.

Key words: Irritable bowel syndrome; Brain–gut axis; Visceral sensitivity; Hypersensitivity; Somatoform disorders; Psychological distress.

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Citation:
Milovac I, Mavija Z, Vidović V, Vidović S. Phenotypic characteristics of patients with irritable bowel syndrome: association between gastrointestinal symptoms and psychological factors – a pilot study. Scr Med. 2026 May-Jun;57(3):607-12.

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Received: 31 March 2026
Revision received: 18 May 20256
Accepted: 19 May 2026

Introduction

Irritable bowel syndrome (IBS) is a chronic functional gastrointestinal (GI) disorder characterised by abdominal pain associated with changes in stool frequency and consistency, without structural or biochemical abnormalities that could explain the symptoms.[1] Diagnosis is established according to the Rome IV criteria, which define IBS as a disorder of the gut-brain axis, visceral hypersensitivity and altered central pain processing in its pathophysiology.[1, 2] IBS phenotypes are clas-

sified into clinical subtypes: diarrhoea-predominant (IBS-D), constipation-predominant (IBS-C) and mixed type (IBS-M), primarily defined based on stool consistency according to the Bristol Stool Form Scale.[3] Beyond differences in defecation patterns, studies have shown that these subtypes also differ in faecal microbiome composition and diversity, further supporting the biological heterogeneity of IBS.[4] Recent reviews indicate that microbiota disturbances can modulate gut function and the gut-brain axis, contributing to IBS symptoms.[5] Psychological factors play an important role in the manifestation and perception of symptoms. Numerous contemporary studies show a high prevalence of anxiety, depression and somatisation among IBS patients, further supporting the concept of dysregulated interactions within the biopsychosocial model of the disease.[1, 6, 7] Moreover, stressful life events and chronic psychological stress have been shown to exacerbate GI symptoms via modulation of the gut-brain axis, including the role of microbiota and neuroimmune interactions.[6, 8, 9]

Modern models of IBS consider it a multidimensional disorder in which GI symptoms interact with central pain processing mechanisms and emotional regulation,[7, 8] as well as with complex communication between the central and enteric nervous systems, the immune system and the gut microbiota.[10, 11] IBS symptoms significantly impact work capacity, daily activities, social functioning and quality of life and contribute to increased healthcare utilisation.[10-12] The clinical heterogeneity of IBS has led to the emergence of endophenotypes, allowing a more precise understanding of variability in clinical presentation. Among the identified endophenotypes are central hypervigilance, psychosocial factors, genetic predisposition and mechanisms localised in the GI tract.[13] In this context, a multidimensional assessment of IBS requires the use of validated instruments that allow quantification of GI symptoms, visceral sensitivity, somatic perception and emotional distress. Integrating these measurement tools enables more precise phenotypic characterisation of IBS patients and a better understanding of the relationships between somatic and psychological determinants of the disease.[14]

The aim of this study was to perform a phenotypic characterisation of IBS patients by assessing GI symptoms, visceral sensitivity and psychological dimensions and to examine their interrelationships.

Methods

Participants

This pilot study included a total of 29 participants: 20 patients diagnosed with IBS according to the Rome IV criteria and 9 healthy controls without gastrointestinal complaints or symptoms overlapping with IBS. Healthy controls were recruited among individuals attending a gastroenterology clinic for routine examination due to a positive family history of colorectal cancer. All controls were free of gastrointestinal symptoms and had no history of IBS or other functional or organic gastrointestinal disorders. All participants voluntarily enrolled in the study and provided written informed consent in accordance with the Declaration of Helsinki. Demographic and clinical data were collected using a Case Report Form (CRF), including age, sex, education level, occupation and personal and family medical history.

Assessment of gastrointestinal and psychological characteristics

Gastrointestinal and psychological parameters were assessed using four questionnaires: the Gastrointestinal Symptom Rating Scale (GSRS) for evaluation of the severity of GI symptoms (abdominal pain, reflux, diarrhoea, constipation, bloating);[15] the Visceral Sensitivity Index (VSI) for assessment of visceral sensitivity and GI-specific anxiety;[16] the Patient Health Questionnaire-15 (PHQ-15) for evaluation of somatic symptoms[17] and the Hospital Anxiety and Depression Scale (HADS) for assessment of anxiety and depression levels.[18]

In this study, harmonised versions recommended within the Cooperation in Science and Technology (COST) Action BM1106 GENIEUR framework were used, with scoring performed according to the protocol for research in the IBS population.[19] This approach enables standardised and comparable assessment of GI and psychological dimensions of IBS within European research networks.

For each questionnaire, a total score was calculated by summing the responses to individual items. A detailed overview of the questionnaire structure and scoring methodology is presented in Table 1.

Table 1: Questionnaires, dimensions and scoring methodology

Questionnaire	Number of items	Dimensions	Scoring method	Interpretation
GSRS	15	Abdominal pain, reflux, diarrhoea, constipation, bloating	Each item scored 0-6	Higher scores → greater intensity of GI symptoms
VSI	15	Fear of symptoms, anxiety related to GI function	Each item scored 0-6	Higher scores → greater visceral sensitivity
PHQ-15	15	Somatic symptoms (head, stomach, muscles…)	Each item scored 0-3	Higher scores → greater level of somatisation
HADS	14	Anxiety and depression	Each item scored 0-4	Higher scores → higher levels of anxiety/depression

Note: GSRS = Gastrointestinal Symptom Rating Scale; VSI = Visceral Sensitivity Index; PHQ-15 = Patient Health Questionnaire-15; HADS = Hospital Anxiety and Depression Scale; GI = gastrointestinal;

Statistical analysis

Data were analysed using SPSS version 18 (*IBM Corp*, Chicago, IL, USA). Descriptive statistics included means and standard deviations (SD) for continuous variables and absolute and relative frequencies for categorical variables. The normality of continuous data distribution was assessed using the Shapiro–Wilk test.

Differences between patients and controls were evaluated using the independent samples t-test, with Levene's test applied to assess homogeneity of variances. For each questionnaire variable, the total score, mean ± SD and Cohen's d were reported to estimate effect size.

Within the patient group, associations between GI and psychological variables were analysed using Spearman's rank correlation coefficient (p) due to the small sample size and deviations from normal distribution observed in some variables. Statistical significance was set at $p < 0.05$. Due to the limited number of participants, subgroup analyses according to IBS subtype were not performed.

Results

Demographic characteristics and IBS subtypes

The patient group (n = 20) consisted of 11 men and 9 women, while the control group (n = 9) included 7 men and 2 women. The mean age of patients was 46.5 years, compared to 48.7 years in controls. The youngest patient was 25 years old and the oldest was 83 years old. No statistically significant difference in age was observed between the groups. Within the patient group, the most prevalent subtype was IBS-D (n = 8), followed by IBS-M (n = 7) and IBS-C (n = 5). No participants were classified as having IBS-un-subtyped.

Comparative analysis of gastrointestinal and psychological symptoms

Patients exhibited significantly higher GI symptoms, visceral anxiety and somatic perception compared to controls (Table 2). The total HADS score was also significantly higher in patients (p = 0.030), with a moderate effect size (Cohen's d = 0.74).

Table 2: Comparison of patients with irritable bowel syndrome (IBS) and controls

Questionnaire	Patients (mean ± SD)	Controls (mean ± SD)	p	Cohen's d
GSRS	31.35 ± 8.68	16.67 ± 3.43	< 0.001	1.97
VSI	52.90 ± 15.36	23.50 ± 7.79	< 0.001	2.17
PHQ-15	3.23 ± 1.42	1.44 ± 1.42	< 0.001	1.25
HADS	34.95 ± 2.46	33.33 ± 1.32	0.030	0.74

Note: Cohen's d indicates effect size; higher questionnaire scores reflect greater symptom severity; GSRS = Gastrointestinal Symptom Rating Scale; VSI = Visceral Sensitivity Index; PHQ-15 = Patient Health Questionnaire-15; HADS = Hospital Anxiety and Depression Scale;

Table 3: Spearman correlations between questionnaires in the irritable bowel syndrome (IBS) group

	GSRS	VSI	PHQ-15	HADS
GSRS	-	p = 0.737**	p = 0.605**	p = 0.333
VSI		-	p = 0.740**	p = 0.484**
PHQ-15			-	p = 0.284
HADS				-

*Note: Spearman's rank correlation coefficient (p) is shown. **p < 0.01; GSRS = Gastrointestinal Symptom Rating Scale; VSI = Visceral Sensitivity Index; PHQ-15 = Patient Health Questionnaire-15; HADS = Hospital Anxiety and Depression Scale;*

Correlations within the IBS group

Within the patient group, Spearman correlations between GI and psychological questionnaires are shown in Table 3. Strong and statistically significant correlations were observed between VSI and PHQ-15 (p = 0.740, p < 0.001) and GSRS and PHQ-15 (p = 0.605, p = 0.001). Correlations of HADS scores with gastrointestinal symptoms were weak to moderate (GSRS–HADS p = 0.333, p = 0.078; VSI–HADS p = 0.484, p = 0.008). While the VSI–HADS correlation was statistically significant, its magnitude was moderate.

Discussion

In this pilot study, IBS patients exhibited higher GI symptom burden, increased visceral sensitivity and elevated somatic symptom perception compared to heathy controls. The most pronounced differences were observed in the domains of visceral hypersensitivity and somatic symptoms, while general emotional distress, as measured by HADS, showed a more modest increase.

Although correlations were observed between GI symptoms and psychological measures, correlations with general anxiety and depression were weaker and not consistently significant. These findings suggest that somatic amplification and visceral hypersensitivity may represent more prominent components of the IBS phenotype than general psychological distress alone. Presented results are in line with the biopsychosocial model of IBS and the concept of disrupted brain–gut interactions, emphasising the role of central pain processing and somatic perception in the subjective experience of symptoms.[1, 7]

The elevated VSI and GSRS scores in presented patient group are in line with the previous findings, which identify visceral hypersensitivity as a key pathophysiological mechanism in IBS.[9, 20] Both experimental and clinical studies have demonstrated a reduced pain threshold to visceral stimuli in IBS patients, supporting the concept of altered peripheral and central sensitivity.[9] Furthermore, contemporary reviews emphasise visceral hypersensitivity as an important neurophysiological feature of the disorder.[20, 21]

The observed associations between visceral sensitivity and somatic symptoms in presented study supports the concept of somatic amplification, characterised by increased awareness and interpretation of bodily sensations. Previous studies have shown that IBS patients may reported elevated somatic symptoms scores even in the absence of clinically significant anxiety and depression.[6] These findings suggest that measures of somatisation, such as PHQ-15, may more specifically reflect IBS-related psychological features compared to general measures of emotional distress.[6, 22]

Although HADS scores were significantly higher in IBS patients, the effect size was moderate and correlations with GI symptoms were weaker compared to those observed with somatic measures. This may indicate that emotional distress plays modulatory rather than primary role, potentially influencing symptom perception and severity in predisposed individuals.[22]

The clinical relevance of IBS is reflected in its substantial impact on quality of life and healthcare utilisation.[8, 11] Although quality of life assessment was not a primary aim of this study, the high GSRS and VSI scores indicate a substantial subjective symptom burden among patients.

These findings support the importance of a multidimensional and individualised approach to IBS, integrating gastrointestinal, somatic and psychological dimensions. Identifying increased visceral sensitivity and somatic symptom perception may contribute to more targeted diagnostic and therapeutic strategies in line with the biopsychosocial model of the disorder.[1, 7] A recent meta-analysis documented consistent alterations in microbiota composition in IBS patients compared to healthy controls, suggesting that dysbiosis may represent an additional component of the disorder's pathophysiological spectrum.[23] Furthermore, emerging evidence indicates that personalising therapeutic strategies by integrating gastrointestinal symptoms, somatic complaints and psychological factors may improve treatment outcomes across different IBS phenotypes.[24]

However, several limitations should be considered. The small sample size and pilot design limit the generalisability of the findings. The control group was recruited from individuals undergoing clinical evaluation due to a positive family history of colorectal cancer, which may introduce selection bias and limit generalisability. Controls were not formally matched to patients by age and sex, which may represent a potential source of bias. Furthermore, the cross-sectional nature of the study precludes conclusions about causality between gastrointestinal and psychological variables. Subgroup analyses according to IBS subtype were not performed due to limited statistical power, which may have obscured potential phenotype-specific differences.

Future studies with larger, well-characterised cohorts are needed to further clarify the relationships between gastrointestinal symptoms, somatic perception and psychological factors and to validate these findings in different clinical contexts.[25]

Conclusion

IBS patients exhibited increased gastrointestinal symptom burden and elevated somatic symptom perception, with visceral hypersensitivity emerging as an important feature of the patient phenotype. The observed associations suggest a stronger link between gastrointestinal symptoms and somatic amplification that with general anxiety and depression measures. These findings support the biopsychosocial model of the irritable bowel syndrome and highlight the relevance of multidimensional patient assessment in the clinical practice. However, given the small sample size and pilot design of the study, the results should be interpreted with caution and require confirmation in larger, well-powered cohorts.

Ethics

The study was approved by the Ethics Committee of the Ethics Committee of the University Clinical Centre of the Republic of Srpska, Banja Luka, decision No 01-9-284.2/13, dated 30 September 2013. Written informed consent was obtained from patients prior to their participation in the study and for publishing of the anonymised data. The study was organised and implemented based on the adherence to the Ethical Principles for Medical Research Involving Human subjects (The Declaration of Helsinki, 8th Revision, 2013).

Acknowledgement

The authors wish to dedicate this article to Dr Zoran Mavija, who passed away before the publication of this work. We gratefully acknowledge his important contribution to this study.

Conflicts of interest

The authors declare that there is no conflict of interest.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Data access

The data that support the findings of this study are available from the corresponding author upon reasonable individual request.

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References

1. Drossman DA, Hasler WL. Rome IV—functional GI disorders: disorders of gut brain interaction. Gastroenterology. 2016;150(6):1257 61. doi: 10.1053/j.gastro.2016.03.035.
2. Ford AC, Sperber AD, Corsetti M, Camilleri M. Irritable bowel syndrome. Lancet. 2020;396(10263):1675 88. doi: 10.1016/S0140-6736(20)31809-0.
3. Lewis SJ, Heaton KW. Stool form scale as a useful guide to intestinal transit time. Scand J Gastroenterol. 1997;32(9):920 4. doi: 10.3109/00365529709011203.
4. Ramic J, Milovac I, Mavija Z, Lojo Kadric N, Hadzic M, Vidovic S, et al. Fecal microbiome diversity in irritable bowel syndrome (IBS) clinical subtypes. Arch Clin Biomed Res. 2021;5(1):125 36. doi: 10.26502/acbr.50170155.
5. Shaikh SD, Sun N, Canakis A, Park WY, Weber HC. Irritable bowel syndrome and the gut microbiome: a comprehensive review. J Clin Med. 2023;12(7):2558. doi: 10.3390/jcm12072558.
6. Saeedinia E, Poursharifi H, Momeni F, Vahedi M, Sadeghi A, Abdi M, et al. Psychological determinants of irritable bowel syndrome and its impact on quality of life: a machine learning approach. Gastroenterol Hepatol Bed Bench. 2025;18(1):100 14. doi: 10.22037/ghfbb.v18i1.3082.
7. Mayer EA, Tillisch K. The brain gut axis in abdominal pain syndromes. Annu Rev Med. 2011;62:381 96. doi: 10.1146/annurev-med-012309-103958.
8. Camilleri M. Peripheral mechanisms in irritable bowel syndrome. N Engl J Med. 2012;367(17):1626 35. doi: 10.1056/NEJMra1207068.
9. Soufan F, Ghosson A, Jaber R, Ghandour A, Uwishema O. The gut brain axis in irritable bowel syndrome: implementing the role of microbiota and neuroimmune interaction in personalized prevention—a narrative review. Health Sci Rep. 2025;8(4):e70660. doi: 10.1002/hsr2.70660.
10. Agarwal N, Spiegel B. The effect of irritable bowel syndrome on health related quality of life and health care expenditures. Gastroenterol Clin North Am. 2010;40(1):11 19. doi: 10.1016/j.gtc.2010.12.013.
11. Bhinder G, Meza Cardon JM, Low A, Aumais G, Attara GP, Gray JR, et al. Irritable bowel syndrome patient experience: a survey of patient reported symptoms by irritable bowel syndrome subtype and impact on quality of life. J Can Assoc Gastroenterol. 2023;6(6):219 28. doi: 10.1093/jcag/gwad028.
12. Patrick DL, Drossman DA, Frederick IO, DiCesare J, Puder KL. Quality of life in persons with irritable bowel syndrome: development and validation of a new measure. Dig Dis Sci. 1998;43(2):400 11. doi: 10.1023/A:1018831127942.
13. Gómez Castaños PC. Irritable bowel syndrome classification and subtypes. Clin Gastroenterol Mex (Engl Ed). 2025;1(1):21 30. doi: 10.24875/cgme.m25000004.
14. Grinsvall C, Törnblom H, Tack J, Van Oudenhove L, Simrén M. Relationships between psychological state, abuse, somatization and visceral pain sensitivity in irritable bowel syndrome. United Eur Gastroenterol J. 2018;6(2):300 9. doi: 10.1177/2050640617715851.
15. Svedlund J, Sjödin I, Dotevall G. GSRS—a clinical rating scale for gastrointestinal symptoms in patients with irritable bowel syndrome and peptic ulcer disease. Dig Dis Sci. 1988;33(2):129 34. doi: 10.1007/BF01535722.
16. Labus JS, Bolus R, Chang L, Wiklund I, Naesdal J, Mayer EA, et al. The Visceral Sensitivity Index: development and validation of a gastrointestinal symptom specific anxiety scale. Aliment Pharmacol Ther. 2004;20(1):89 97. doi: 10.1111/j.1365-2036.2004.02007.x.
17. Kroenke K, Spitzer RL, Williams JB. The PHQ 15: validity of a new measure for evaluating the severity of somatic symptoms. Psychosom Med. 2002;64(2):258 66. doi: 10.1097/00006842-200203000-00008.
18. Zigmond AS, Snaith RP. The hospital anxiety and depression scale. Acta Psychiatr Scand. 1983;67(6):361 70. doi: 10.1111/j.1600-0447.1983.tb09716.x.
19. COST Association. COST Action BM1106 GENIEUR: Harmonized assessment tools for IBS research [Internet]. [Cited: 1-Mar-2026]. Available from: https://www.cost.eu/actions/BM1106/.
20. Deiteren A, de Wit A, van der Linden L, de Man JG, Pelckmans PA, de Winter BY. Irritable bowel syndrome and visceral hypersensitivity: risk factors and pathophysiological mechanisms. Acta Gastroenterol Belg. 2016;79:29 38.
21. Dudzinska E, Grabrucker AM, Kwiatkowski P, Sitarz R, Skienkiewicz M. The importance of visceral hypersensitivity in irritable bowel syndrome—plant metabolites in IBS treatment. Pharmaceuticals (Basel). 2023;16:1405. doi: 10.3390/ph16101405.
22. Qin H, Cheng C, Tang X, Bian Z. Impact of psychological stress on irritable bowel syndrome. World J Gastroenterol. 2014;20(39):14126 31. doi: 10.3748/wjg.v20.i39.14126.
23. Li X, Li X, Xiao H, Xu J, He J, Xiao C, Zhang B, et al. Meta analysis of gut microbiota alterations in patients with irritable bowel syndrome. Front Microbiol. 2024;15:1492349. doi: 10.3389/fmicb.2024.1492349.
24. Black CJ, Ford AC. Personalisation of therapy in irritable bowel syndrome: a hypothesis. Lancet Gastroenterol Hepatol. 2024;9(12):1162 76. doi: 10.1016/S2468-1253(24)00245-0.
25. World Gastroenterology Organisation. Irritable bowel syndrome global guidelines [Internet]. [Cited: 1-Mar-2026]. Available from: https://www.worldgastroenterology.org/guidelines/irritable-bowel-syndrome-ibs/irritable-bowel-syndrome-ibs-english.