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ANXIETY AND DEPRESSION IN IRRITABLE BOWEL SYNDROME

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ABSTRACT

Irritable Bowel Syndrome (IBS) is a common functional gastrointestinal disorder that significantly affects patients' quality of life. It often coexists with psychological conditions such as anxiety and depression, indicating a strong connection between the gut and the brain. The exact etiology of IBS is multifactorial and remains unclear, but involves alterations in gut motility, visceral hypersensitivity, brain-gut axis dysregulation, and psychosocial stress.

Aim of the Study: This study aims to examine the complex relationship between IBS, anxiety, and depression by reviewing the psychological, neurological, and gastrointestinal mechanisms involved. It also evaluates how these interactions influence symptom severity and outlines integrated therapeutic approaches.

Materials and Methods: The analysis of literature was carried out in a structured manner using the databases PubMed, Google Scholar, and Medline. The research aimed to identify studies discussing the connection between irritable bowel syndrome (IBS) and accompanying psychological disorders, with a particular focus on anxiety and depression. Search terms included "irritable bowel syndrome," "anxiety," "depression," "gut-brain axis," and "psychological comorbidities." The review incorporated peer-reviewed scientific articles, systematic reviews, meta-analyses, and clinical practice guidelines. Publications such as case reports, editorials, conference summaries, and non-academic sources were excluded. Only studies published in English and Polish from the years 2000 to 2024 were taken into account. The main inclusion criterion was the relevance of the content to the mechanisms, clinical features, psychological aspects, and treatment strategies related to IBS.

Results: Evidence supports a bidirectional link between IBS and mental health disorders. Multimodal treatment strategies, such as the low-FODMAP diet, probiotics, cognitive-behavioral therapy, and stress management, show effectiveness in improving symptoms.

Conclusions: IBS requires a holistic, patient-centered approach that addresses both physical and psychological components. Personalized interventions that incorporate mental health support are crucial for improving outcomes. Continued research is essential to further explore gut-brain mechanisms and optimize treatment strategies.

Keywords: Irritable Bowel Syndrome, anxiety, depression, gut-brain axis, psychological comorbidity.

INTRODUCTION

Irritable Bowel Syndrome (IBS) is a functional gastrointestinal condition, identified by recurrent abdominal pain or discomfort alongside irregular bowel habits [57]. Despite being one of the most prevalent gastrointestinal disorders, the exact cause of irritable bowel syndrome (IBS) is still unclear [58]. IBS poses a considerable strain on individuals, affecting their quality of life and work productivity. This condition can be intensified by factors like stress and lifestyle choices, which may also trigger or worsen symptoms [72]. Moreover, anxiety and depression are frequently observed comorbidities in individuals with IBS [43]. Psychosocial stress, along

with past trauma and abuse, heavily influences both the development and persistence of IBS symptoms [20]. The pathophysiology of IBS remains largely unclear, so treatment primarily focuses on symptom relief rather than targeting the underlying cause(s) of the disorder [33].

It is essential to conduct psychiatric screenings for patients with IBS and adopt a holistic approach to improve outcomes in managing these cases [32]. Various treatment approaches are available to manage symptoms, including medications, dietary adjustments and psychotherapy [73].

This article provides an overview of the biological and neuropsychological pathways involved in the relationship between irritable bowel syndrome (IBS) and mood disorders such as anxiety and depression. It focuses on current hypotheses regarding gut–brain communication, microbiota imbalances, immune system involvement, and disrupted signaling in the central nervous system. The review also outlines therapeutic options from both the medical and psychological domains, with an emphasis on their potential to target both gastrointestinal symptoms and emotional distress. Importantly, it points to the need for further research aimed at developing personalized treatment models and closing the gaps in our current clinical understanding.

AIMS

This narrative review aims to explore the complex relationship between irritable bowel syndrome (IBS), anxiety, and depression. It focuses on the underlying biological, neurological, and psychological mechanisms, and evaluates integrated treatment strategies that address both gastrointestinal and mental health symptoms.

METHODS

A structured literature search was conducted using PubMed, Medline, and Google Scholar, covering publications from 2000 to 2024. Keywords included: irritable bowel syndrome, anxiety, depression, gut-brain axis, psychological comorbidity. Only peer-reviewed articles in English and Polish were included. Exclusion criteria involved non-academic sources, case reports, and editorials.

RESULTS AND DISCUSSION

The review confirms a bidirectional relationship between IBS and mental health disorders. It highlights biological and psychological mechanisms that link gut and brain function, and presents evidence supporting multimodal treatments, including dietary changes, probiotics, pharmacotherapy, and psychotherapy.

PATHOGENESIS AND CLINICAL CHARACTERISTICS OF IRRITABLE BOWEL SYNDROME

IBS is a common condition globally, with a prevalence affecting around 11% of the population, regardless of geographic location or demographic setting [7]. A well-known risk factor for IBS is acute enteric infection, though the condition also appears more frequently among young adult women and individuals with psychological comorbidities compared to the general population [22]. An additional independent risk factor for IBS involves proinflammatory elements in the diet. Those with IBS often exhibit chronic, low-grade inflammation in the intestinal mucosa [41]. IBS exhibits a complex and varied pathogenesis, involving factors like altered motility, visceral sensitivity, brain-gut interactions, and psychosocial stress. Though these abnormalities are commonly seen in patients, none can fully explain IBS symptoms across all cases [9].

In the absence of specific biological markers for IBS, physicians generally rely on symptom-based criteria for diagnosis [28]. According to the Rome IV criteria, IBS is identified as a functional bowel disorder characterized by recurrent abdominal pain linked to defecation or changes in bowel habits, often involving constipation, diarrhea, or a mix of both. For diagnosis, these signs should have started at least six months earlier and been present in the most recent three months [36]. Patients frequently report that, beyond abdominal pain, they experience a range of troubling symptoms, including muscle strain, aches, a sense of urgency, bloating, and an overwhelming feeling of being seriously unwell [55]. IBS is classified by predominant stool patterns. In IBS with constipation (IBS-C), hard or lumpy stools occur in at least 25% of bowel movements. IBS with diarrhea (IBS-D) features loose or watery stools in at least 25% of cases. Mixed IBS (IBS-M) includes both hard and loose stools in at least 25% of bowel movements. Lastly, unsubtyped IBS shows insufficient changes in stool consistency to meet the criteria for other IBS types [16].

IBS is a complex, multifactorial condition with an unclear molecular pathophysiology. Causative factors likely vary between individuals and may appear in unique combinations for each patient [50]. Patients with IBS frequently note that similar symptoms are present among their family members. The most compelling genetic association identified in IBS research relates to a polymorphism in the serotonin transporter gene [49]. The two-way communication system between the central nervous system and the gastrointestinal tract, known as the brain-gut-microbiota axis, appears to be disrupted in IBS. Recent findings also link dysfunctions within this axis to various psychiatric disorders [48]. Stress significantly impacts brain–gut interactions, potentially

triggering or worsening IBS symptoms. A pathophysiologic model for IBS might incorporate both central factors, such as trauma and anxiety, along with peripheral issues like gut inflammation, motility changes, and heightened sensitivity [8]. The regulation of stress responses, including behavioral, neuroendocrine, and autonomic reactions, heavily depends on the hypothalamic-pituitary-adrenal (HPA) axis. This axis, along with the sympathetic nervous system, constitutes the main system for handling stress. An overactive HPA axis may play a role in the development of IBS [19]. Disruption in the central regulation of visceral sensation and intestinal barrier function can result in visceral hypersensitivity and a leaky gut, which are primary contributors to IBS [29]. IBS also has been linked to changes in the composition of intestinal microbiota and imbalances in fecal organic acid levels [64].

THE RELATIONSHIP BETWEEN IRRITABLE BOWEL SYNDROME AND DEPRESSION

Studies indicate that, independent of IBS subtype, individuals with IBS exhibit significantly higher levels of depression and anxiety compared to healthy controls [38]. Patients with IBS are three times more likely to experience anxiety or depression than those without the condition [74]. One study found that depressive symptoms affect around 20%-40% of individuals with IBS [75]. Chronicity increases the risk of developing depression, meaning that prolonged exposure to stressors and persistent IBS symptoms raise the likelihood of depressive symptoms [44].

Inability to effectively manage or adapt to stressful situations can lead to depression in patients with IBS [62]. Another study demonstrated that greater reliance on passive behavioral coping strategies is linked to heightened severity of depression in individuals with IBS [14].

In individuals with IBS, psychosocial factors are clearly linked to an overall increase in gastrointestinal symptoms. Higher levels of depression and somatization, in particular, intensify these symptoms after meals [70]. Shared neurobiological mechanisms may underlie both IBS and depression, influencing brain-gut interactions and mood regulation. Furthermore, there is evidence of a familial link between major depressive disorder and IBS [26]. Studies suggest that IBS patients exhibit altered functioning in brain regions that process visceral sensory information, including the prefrontal cortex, anterior cingulate cortex, and thalamus. These areas are components of the limbic system, which is also implicated in the pathophysiology of depression [2]. Research has identified that IBS patients experiencing depressive symptoms have structural abnormalities in specific brain areas tied to the prefrontal-limbic circuit, which is involved in processing pain and emotions. These brain changes may contribute to a cycle where depressive symptoms and gastrointestinal issues mutually reinforce and exacerbate each other [40]. The presence of fatigue and depression has been linked to increased counts of specific mucosal cells, notably mast cells, within the colon’s lining. This relationship implies that psychological factors may contribute to the low-grade inflammatory response seen in IBS [53]. It has been observed that in cases of co-occurring IBS and depression, there is a significant reduction in microbial diversity, notably with lower levels of Bifidobacterium and Lactobacillus species [52]. Imbalances in the gut microbiota can intensify stress responses and exacerbate symptoms of depression [76].

THE RELATIONSHIP BETWEEN IRRITABLE BOWEL SYNDROME AND ANXIETY

Stress, according to Hans Selye's theory, is a state that threatens the homeostasis of our body [30]. Its sources can be realistic threats (e.g., job loss or a car accident) or psychological threats (based on subjective emotions and perception). Selye argued that stress is responsible for triggering adaptive responses in the body aimed at protecting and preparing the organism for an impending threat [30, 56]. However, this idea is not his original discovery – in ancient times, figures like Hippocrates (460–377 BCE) and Galen (129–199 CE) discovered connections between emotions and the body's response [56, 42]. Other significant researchers of the stress phenomenon are Richard Lazarus and Susan Folkman [5, 17], who described it as a dynamic response of the organism in relation to its environment. According to these authors, stress arises from cognitive appraisal, which is divided into primary appraisal (the analysis of the situation) and secondary appraisal (the evaluation of one's own abilities and resources), which are interrelated. In response to perceiving a situation as stressful, the coping process is activated, which can be directed towards emotions or problem-solving. The choice of coping strategy depends on the assessment of the situation and can lead to a change in its initial interpretation. Lazarus and Folkman, in contrast to Selye, who focused mainly on the biological aspects, were the first to emphasize the relationship between the individual and their environment, contributing to the development of the transactional model of stress [30, 5, 17]. An important contribution to understanding stress responses was also made by Stevan Hobfoll [27], who described stress reactions in terms of gains and losses:

- a gain refers to the increase of new resources after previously investing some of the resources already possessed.
- a loss refers to the threat and/or actual loss of resources as a result of a stress-inducing situation.

Both gaining and losing resources can mutually intensify each other, but the loss of resources is more burdensome for the individual. This can negatively affect their well-being as well as their functioning. According to Hobfoll [27, 11], vulnerability to resource loss depends on the number of resources an individual possesses — the more resources they have, the less vulnerable they are to losing them. At the same time, such individuals are more likely to initiate a spiral of gains, even in extreme stress conditions, which are often associated with resource loss. On the other hand, individuals with a resource deficit are more prone to further loss of resources because the lack of initial resources prevents them from investing, leading to the initiation of a spiral of losses [11]. Hobfoll's concept appears to be useful in analyzing the connections between an individual's coping strategies and the negative effects of stress, particularly on a clinical level. Illness can therefore be viewed as the loss of immune resources needed to fight potential pathogens. Health, according to the theory of gains and losses, is determined by the amount of resources an individual possesses. A higher number of resources provides greater opportunities for multiplication through investment, which may lead to the improvement and maintenance of the organism's homeostasis [47].

An important aspect of the stress response is the phenomenon of anticipation, which involves predicting the possibility of a stress-inducing stimulus [35]. This response helps us better understand the relationship between stress and anxiety. According to the definition of anxiety in the DSM-V [3], anticipation is an integral element of the phenomenon, which leads us to assume the existence of similar mechanisms underlying both reactions [15]. Additionally, studies conducted on animals have shown that many brain structures (such as the amygdala, prefrontal cortex, and nucleus accumbens) are involved in the occurrence of pathological levels of stress or anxiety disorders, such as generalized anxiety disorder (GAD) [65, 37]. Evidence of neuronal circuits activated in both anxiety and stress situations further supports the existence of a relationship between these phenomena [35, 65, 37].

A crucial element from the perspectives of psychology, psychiatry, and gastroenterology is the connection between anxiety and fear levels and responses from the gastrointestinal system. Stress, by activating the immune response in the intestines, leads to phenomena such as inhibition of stomach acid production, an increase in bicarbonate production in the duodenum, and a reduction in the synthesis of acidic mucopolysaccharides in the mucous membrane [60]. Disrupted intestinal homeostasis results in an imbalance in its microbiota, including the loss of probiotic bacteria, such as those from the Lactobacillus group [25]. A decrease in the levels of microorganisms responsible for maintaining gastrointestinal homeostasis may increase the risk of pathogenic bacteria development and raise susceptibility to infections [25, 67]. Another significant phenomenon linking stress to gastrointestinal health is the release of corticotropin (ACTH) by the pituitary gland. This hormone stimulates the production of cortisol, also known as the stress hormone, which can lead to an increase in the concentration of pathogenic bacteria [63, 4]. It is worth mentioning that the relationship between stress and gut microbiota is bidirectional. The microbiome has the ability to influence the entire HPA axis, affecting processes related to the synthesis, release, and signaling pathways of glucocorticoids [6, 71]. The presence of high cortisol levels, associated with excessive stress, is characteristic of the biopsychosocial model of IBS [69]. Psychosocial factors, by modifying HPA axis hormone levels, will disrupt the secretory and barrier functions of the intestinal mucosa, which in turn affects the microbiome [69, 12]. Studies suggest that up to 66% of patients with irritable bowel syndrome (IBS) have a current psychiatric diagnosis from Axis I [59]. The most common psychiatric disorders co-occurring with IBS include generalized anxiety disorder, bipolar affective disorder, depression, and schizophrenia [59, 39]. Despite numerous studies confirming the link between IBS and mental disorders, there is no clear answer regarding the cause of this relationship. Researchers struggle to determine the directionality of the phenomenon—whether gut microbiota influences the development of mental disorders or, conversely, excessive stress and related disorders negatively impact the microbiome, leading to gastrointestinal diseases, including IBS [10, 18].

Numerous studies have confirmed a strong association between irritable bowel syndrome (IBS) and mental health disorders, particularly anxiety and depression. The prevalence rates vary depending on the population studied, diagnostic criteria used, and research methodologies applied. Table 1 summarizes selected studies that have investigated the co-occurrence of anxiety and depressive disorders in individuals with IBS. The table includes information on the authors, year of publication, country of study, sample size, diagnostic tools employed, and the key findings of each study.

Table 1. Prevalence of anxiety and depressive disorders in IBS according to various studies

Authors	Year	Country	Sample Size	Diagnostic Tools	Findings

Lee et al. [38]	2017	South Korea	Meta-analysis	HADS, BDI, STAI, CES-D (various tools)	IBS patients had significantly higher levels of anxiety and depression.
Zamani et al. [74]	2019	Multiple (review)	94 studies	Various structured clinical interviews/ questionnaires	Patients with IBS were 3× more likely to have anxiety or depression.
Sugawara et al. [62]	2017	Japan	Not specified	Self-report questionnaires	Passive coping associated with increased depression severity in IBS.
Khasawneh et al. [59]	2017	India	Not specified	Clinical diagnosis	66% of IBS patients had a current Axis I psychiatric disorder.
Zhang et al. [75]	2018	China	Meta-analysis	Various	Depressive symptoms in 20–40% of IBS patients.
Wang et al. [76]	2025	International	Genetic cohort study	GWAS and Mendelian randomization methods	Bidirectional relationship between psychiatric disorders and IBS confirmed.

THERAPEUTIC APPROACHES IN IRRITABLE BOWEL SYNDROME

Treating IBS focuses on enhancing patients' quality of life by reducing symptoms through both pharmacologic and nonpharmacologic approaches. For cases where symptoms are intense enough to need medication, treatment selection depends on whether diarrhea or constipation is the main issue [66]. Management of IBS primarily relies on a combination of treatments tailored to specific symptoms. For diarrhea, antidiarrheals and antispasmodic drugs are commonly used, while constipation is managed through a high-fiber diet and prokinetic medications. Low doses of antidepressants are sometimes introduced to help stabilize gut motility. Beyond medications, other methods such as psychotherapy, lifestyle and dietary adjustments, acupuncture, and herbal treatments are also applied to support symptom relief [24].

Dietary changes, particularly limiting certain short-chain carbs known as FODMAPs (fermentable sugars and fibers), show promise for IBS treatment. Evidence suggests that reducing these compounds, along with specific probiotics, may positively affect IBS by targeting gut bacteria, inflammation, motility and visceral hypersensitivity [1]. Dietary therapy for IBS emphasizes principles of balanced eating and lifestyle adjustments, which include maintaining regular meal times, managing fiber intake, ensuring sufficient hydration, monitoring alcohol and caffeine consumption, reducing fat intake, and evaluating spicy food components that could trigger symptoms [45]. Implementing a low-FODMAP diet can significantly alleviate IBS symptoms and improve overall quality of life. This approach is typically advised for 2–8 weeks during severe symptom episodes, with a gradual reintroduction of regular foods once symptoms are under control [68]. While probiotics are generally safe and can positively influence mood, they should not be considered a substitute for antidepressant medications as the primary treatment for depression. Instead, probiotics may be beneficial as an adjunctive therapy alongside standard treatments [46]. An effective strategy to reduce IBS risk involves replacing sedentary behavior with either sufficient sleep or engaging in intense physical activity, regardless of an individual’s genetic susceptibility [23]. Engaging in regular, moderate exercise may positively impact IBS symptoms, as it has been shown to improve mood and alleviate issues like fatigue, bloating, and constipation in healthy adults [31].

For IBS patients, especially those with psychological comorbidities or who have not responded to typical treatments, SSRIs could offer therapeutic benefits. These improvements, likely linked to the brain-gut axis, can enhance patients' quality of life and overall sense of well-being, even though the precise mechanisms remain

unclear [51]. One study observed that patients treated with paroxetine over an extended period showed marked improvements in both psychological and gastrointestinal symptoms [61]. Rifaximin, as an antibiotic, may reduce symptoms of irritable bowel syndrome, such as abdominal pain and diarrhea, supporting the theory that bacterial overgrowth could be a significant factor in the development of this condition [61].

Aiming to alleviate IBS symptoms, interventions are designed to incorporate comprehensive strategies, such as targeted techniques for managing stress effectively [34]. Psychotherapy can enhance the quality of life related to health for patients experiencing severe IBS [13]. Therapies like cognitive behavioral therapy, hypnotherapy, and psychodynamic therapy are more effective in reducing overall IBS symptoms than conventional treatment methods [54]. Unlike pharmacological treatments, psychological therapies such as CBT focus on the brain's executive regions to adjust cognitive, emotional, and behavioral responses to IBS symptoms. This process can lower anxiety associated with symptoms—which might otherwise intensify IBS through the enteric nervous system—and also supports improved social functioning [21]. A wide range of therapeutic strategies have been explored for the treatment of irritable bowel syndrome (IBS), especially in patients who also suffer from anxiety and/or depression. Table 2 summarizes different treatment modalities including dietary, pharmacological, and psychological approaches. It presents their effects on gastrointestinal and mental health symptoms, as well as the corresponding level of scientific evidence supporting their effectiveness.

Table 2. Effectiveness of various therapeutic approaches in IBS with comorbid anxiety and/or depression

Treatment Type	Effects on IBS Symptoms	Effects on Mental Health	Level of Evidence
Low-FODMAP Diet	Significantly reduces bloating, abdominal pain, and irregular bowel habits	May reduce anxiety levels indirectly via symptom relief	High (systematic reviews, RCTs)
Probiotics	Improves gut microbiota balance and reduces GI symptoms	Can modestly improve mood when used as adjuncts	Moderate (meta-analyses, clinical trials)
SSRIs (e.g., paroxetine)	Stabilize gut motility and reduce pain perception	Effective in treating comorbid depression and anxiety	High (RCTs, clinical guidelines)
Cognitive Behavioral Therapy (CBT)	Improves pain tolerance, reduces symptom severity	Strong evidence for reducing anxiety and depressive symptoms	High (meta-analyses, clinical practice)
Physical Activity	Improves bowel function and reduces discomfort	Enhances mood, reduces fatigue and depressive symptoms	Moderate (observational studies, trials)
Hypnotherapy	Reduces pain and overall symptom severity	Improves emotional well-being and anxiety	Moderate (clinical studies, patient reports)
Psychodynamic Therapy	May reduce symptom distress through emotional insight	Improves self-awareness and mood regulation	Low to Moderate (limited controlled studies)

The treatment of IBS requires a holistic approach that integrates various strategies, addressing both physical symptoms and psychological factors. By considering the whole person—through medication, dietary changes, lifestyle adjustments, and psychological support—patients can achieve better symptom management and improved quality of life. This comprehensive approach is essential for effectively managing IBS and supporting long-term well-being.

LIMITATIONS

Nevertheless, this review has several important limitations. Firstly, the literature analyzed was limited to publications in English and Polish, which may have excluded significant findings from studies published in other languages. Secondly, a large portion of the included research consists of observational or correlational studies, which restrict the ability to draw firm conclusions about causality. Thirdly, there is a lack of comprehensive, high-quality randomized controlled trials (RCTs) that simultaneously evaluate the long-term impact of combined gastrointestinal and psychological interventions. Furthermore, inconsistencies in sample selection, diagnostic methodologies, and measurement tools across studies limit the applicability of results to the broader IBS population.

Future studies should aim to overcome these limitations by prioritizing large-scale, longitudinal RCTs, employing standardized diagnostic frameworks, and testing multimodal treatment strategies across diverse and representative populations. Addressing these gaps will be essential for refining clinical practice, improving patient outcomes, and deepening our understanding of the intricate relationship between IBS and mental health.

CONCLUSIONS

Irritable Bowel Syndrome (IBS) represents a multifactorial disorder that profoundly affects not only the digestive system but also the psychological and social functioning of individuals. The frequent overlap between IBS and mental health issues such as anxiety and depression strongly suggests a dynamic and bidirectional interaction between the gut and the brain, necessitating an approach to treatment that is equally multidimensional. While current research supports the effectiveness of various therapeutic options—ranging from dietary interventions like the low-FODMAP diet, the use of probiotics, and targeted pharmacotherapy, to psychological methods including cognitive behavioral therapy and stress-reduction techniques—our understanding of the exact biological, neurological, and emotional mechanisms that underpin this interaction remains incomplete. Dysfunctions in gut motility, visceral sensitivity, immune responses, and brain-gut-microbiota communication are implicated, but their causal relationships and interdependencies still require clarification.

The clinical relevance of these findings lies in the imperative to adopt a holistic, interdisciplinary model of care, one that incorporates routine psychological screening, individualized treatment planning, and close collaboration between gastroenterologists, psychologists, dietitians, and primary care providers. Such an approach allows for the personalization of treatment strategies, not only to address the physical manifestations of IBS but also to manage psychological distress that may exacerbate symptoms or impair quality of life. Multidisciplinary care that integrates mental health support is likely to yield better long-term outcomes and improve patient satisfaction with treatment.

AUTHOR CONTRIBUTIONS

Analysis and Preliminary Research: Kamila Sieradocha

Planning and Designing: Natalia Śluzek

Writing and Editing: Kamila Sieradocha, Natalia Śluzek

Data Analysis: Kamila Sieradocha, Natalia Śluzek

Scientific Verification: Kamila Sieradocha

Summary and Conclusions: Kamila Sieradocha, Natalia Śluzek

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CONFLICT OF INTEREST

The authors deny any conflict of interest.

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