



Mindfulness-Based Interventions for Irritable Bowel Syndrome: A Systematic Review

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Abstract

Introduction: Irritable Bowel Syndrome (IBS) affects up to 20% of individuals worldwide, which leads to emotional distress and imposes significant healthcare expenses. Given the multifactorial nature of IBS symptoms and the absence of a cure, this review shed light on the efficacy of mindfulness-based interventions in alleviating IBS symptoms and improving the quality of life in IBS patients.

Methods: A systematic literature search was conducted using PubMed and Embase databases to identify Randomized Clinical Trials (RCTs) that examined the efficacy of mindfulness-based interventions in IBS patients. The inclusion criteria were adults (over 18 years) previously diagnosed with IBS based on the ROME II/III/IV criteria.

Results: A total of 213 references were identified in the databases. From these, nine RCTs involving 503 participants were included in this review. The interventions demonstrated improvements in IBS symptoms and quality of life. However, most of the studies were severely affected by bias.

Discussion: Most RCTs demonstrated a reduction in symptoms and an improvement in quality of life. However, it is essential to acknowledge certain methodological limitations, such as small sample sizes, lack of blinding, and high risk of bias, including selection and attrition.

Conclusion: Despite acknowledged biases and restricted generalizability in the examined studies, it emphasizes the need for rigorous evidence to validate mindfulness effectiveness. Future research must prioritize bias reduction, include diverse populations, and broaden applicability. This review highlights the potential of mindfulness in relieving symptoms and enhancing the quality of life in IBS individuals.

Introduction

Irritable bowel syndrome (IBS) is a common gastrointestinal disorder characterized by abdominal pain and irregular bowel movements (Drossman & Tack, 2022). IBS affects approximately 20% of the global population and constitutes 30% of gastroenterology

referrals (Lovell & Ford, 2012; NIDDK, 2022). According to Shah et al. (2020), due to the brain-gut connection influencing its development, many people with IBS also experience emotional or psychiatric symptoms, which are linked to emotional burden, distress, and higher healthcare expenses. There is no cure for IBS, and treatments primarily aim to alleviate its multiple symptoms (Cearley et al., 2017). Thus, given its link to stress, diet, psychological, and social factors, mind-body interventions developed to target these areas can be an alternative to adjuvant management of IBS (Quigley et al., 2015).

Mindfulness, "the practice of being aware of your body, mind, and feelings in the present moment,

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Received: September 8, 2023 Accepted: November 9, 2023

Published: November 28, 2023

Editor: Felipe Fregni Reviewers: Melanie Duran, Angie Pichardo, Raphael Haddad, Inia Perez

Keywords: mindfulness, irritable bowel syndrome

DOI: <http://dx.doi.org/10.21801/ppcrj.2023.93.9>

thought to create a feeling of calm" (Cambridge University Press, 2023), fosters a deep link between emotional well-being and physical health. Mindfulness-based therapy (MBT) 2 holds promise as this method has previously been shown to reduce anxiety and enhance overall mental health. Despite advancements, more knowledge is needed regarding the efficacy of MBT in managing IBS symptoms.

This review assesses the potential of novel mindfulness interventions to address IBS management's challenges, ultimately advancing our understanding and treatment of this common gastrointestinal disorder.

Materials and Methods

Study design

This review adheres to the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guidelines (Page et al., 2021). It was registered with the International Prospective Register of Systematic Reviews (PROSPERO) under registration number 453552.

Search strategy

A systematic literature search was conducted in PubMed and Embase databases, focusing on randomized controlled clinical trials (RCTs) published from the inception database to August 28, 2023. The search strategies, comprised of headings and synonyms for the entry terms "mindfulness" and "irritable bowel syndrome," are presented in Table 1.

Selection of studies - inclusion and exclusion criteria

- **Participants:** Subjects aged ≥ 18 that fit Rome II/III/IV criteria for IBS.
- **Interventions:** The review included mindfulness-based interventions (e.g., mindfulness-based cognitive therapy or stress reduction) without duration, frequency, or administration limitations.
- **Comparison:** Studies needed to include a control group for between-group intervention comparisons, which could be either active (e.g., cognitive behavioral therapy) or passive (e.g., placebo or waitlist).
- **Outcomes:** The review analyzed clinical and surrogate outcomes for gastrointestinal symptom changes without outcome-type restrictions.
- **Study design:** Randomized Clinical Trials.
- **Studies in languages other than English** were excluded if researchers required additional proficiency or faced obstacles in interpreting the results due to non-native fluency. This approach reduces language and publication bias while preserving the review's

integrity.

Screening process

To ensure a comprehensive collection of valuable literature, no filters were applied regarding language or publication date limitations during the initial selection process. The reference manager software, Zotero version 6.0.27, removed duplicate reports before accessing the remaining references and abstracts (Zotero, 2016). Two researchers independently screened articles by title and abstract. In case of disagreement, a third researcher resolved conflicts. The selected papers underwent a thorough assessment by the same reviewers to ensure they met the inclusion criteria, excluding any that did not.

Data extraction

Six independent authors rigorously extracted essential data from selected studies, addressing discrepancies through discussion and consensus, following established guidelines for systematic reviews (Page et al., 2021). The information encompassed the first author, publication year, study population details, mindfulness intervention variations, control group description, primary outcomes, RCT confirmation, and study findings relevant to IBS Severity Scoring System (IBS-SSS) and IBS Quality of Life (IBS-QoL) assessment. A standardized data extraction form was consistently employed, and attempts to contact original study authors were made for additional information when needed.

Quality assessment

After the final selection of the articles, the quality assessment was done by two independent investigators according to the Risk of Bias 2 (RoB2) tool for randomized trials (Sterne et al., 2019).

Results

Study selection

The search strategy identified a total of 213 papers. After removing 65 duplicate articles, the remaining 148 references were screened by analyzing their titles and abstracts. From this 148, there was a concordance of 127 articles by the two researchers. The conflicting references were submitted to an analysis by a third researcher. Unfortunately, we could not translate two of the studies, one from Kafi M. et al. (2014) and the other from Mohamadi

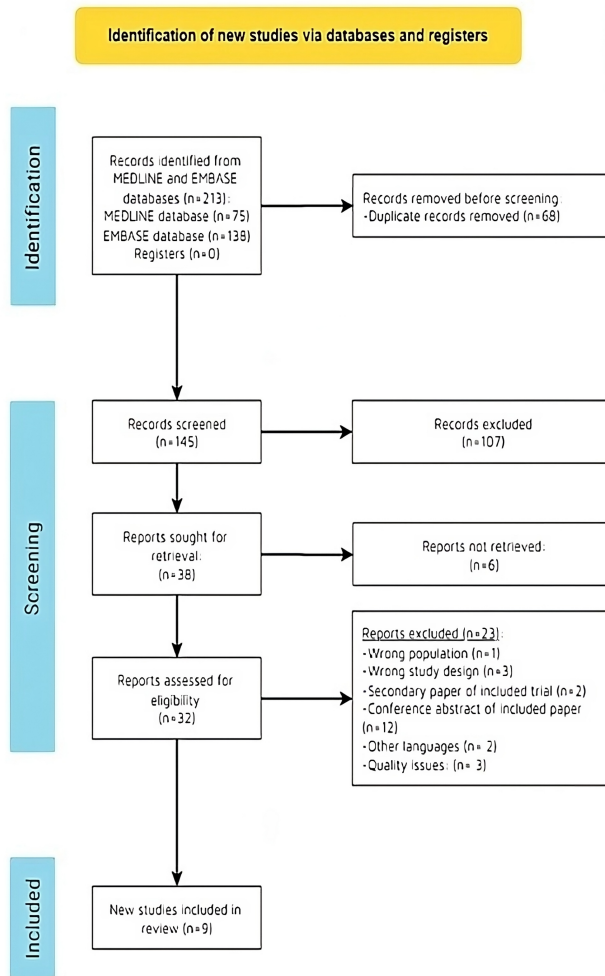


Figure 1: PRISMA flow diagram.

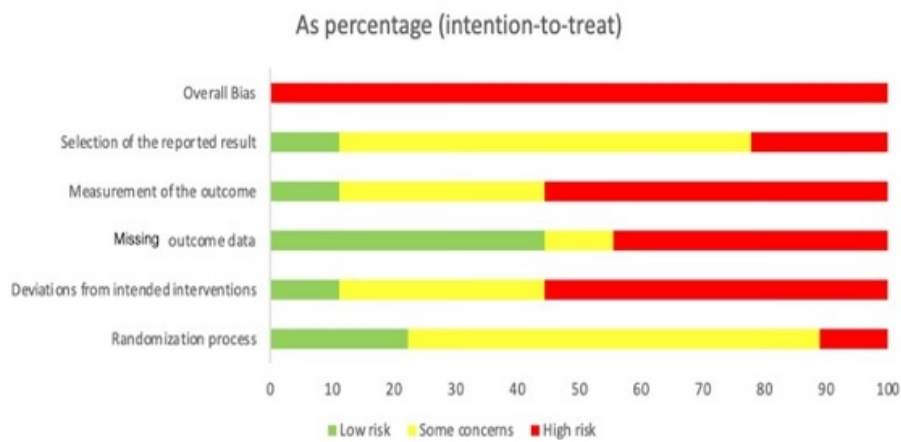


Figure 2: RoB2 assessment of bias, percentage.

Database	Search Strategy
PUBMED	("Irritable Bowel Syndrome"[MeSH] OR "Irritable Bowel Syndrome" [tiab]) AND ("Mindfulness"[MeSH] OR "MBI"[tiab] OR "Mindful*"[tiab]) Embase <1974 to 2023 August 28>
EMBASE	1 (Irritable Bowel Syndrome or irritable colon).mp. 35568 2 (mindfulness or mindfulness meditation).mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword heading word, floating subheading word, candidate term word] 20094 3 mindful*.ti. 9808 4 mindful*.ab. 19851 5 2 or 3 or 4 24907 6 1 and 5 186 7 3 or 4 20881 8 1 and 7 138

Table 1: The search strategy used in the databases included.

J. et al. (2015), and it was impossible to reach the authors. The studies from Naliboff B.D. et al. (2020), Ashraf et al. (2022), and Harding et al. (2018) were excluded due to lacking a comparison between intervention and control groups. Thus, after carefully reviewing the references pool, nine studies were ultimately selected for our review. The study selection flow diagram is described in Figure 1.

Description of the studies

Table 2 summarizes the main characteristics of the nine included studies in terms of population characteristics, intervention, comparison, primary outcome, study design, and main outcomes. The articles were published between 2011 and 2020. The sample size ranged from 24 to 90 patients with IBS, totaling 503. Two articles considered Rome II criteria, five articles considered Rome III criteria, and two articles were described according to Rome IV criteria. Seven of the studies utilized the IBS-SSS as the primary outcome measurement tool, whereas 1 study used the IBS-QoL, and another employed the Gastrointestinal Symptom Rating Scale for IBS (GSRS-IBS) scale. The studies also assessed IBS improvement using various secondary outcome measures, including visceral sensitivity, pain catastrophizing, symptom inventory improvement, depression anxiety scales, and the Calgary Symptoms of Stress Inventory (C-SOSI).

Gaylord et al. (2011) and Garland et al. (2012) evaluated the same group of 75 female patients, comparing Mindfulness Training (MT) to a support group in reducing the IBS-SSS as the primary outcome. The IBS-SSS is a 500-point visual analog questionnaire

that inquires about the level of abdominal pain, frequency of abdominal discomfort, extent of abdominal bloating, discontentment with bowel habits, and disruption to overall QoL during the preceding ten days. This score quantifies these aspects to understand the patient's symptom severity comprehensively. Gaylord et al. (2011) showed a significant reduction in IBS severity after eight weeks of mindfulness training, suggesting that MT increased the reinterpretation of pain sensation with an average reduction of 38.2% in symptom scores. Gaylord et al. (2011) also observed an improvement in QoL in the intervention group. Whereas Garland et al. (2012) analyzed the simultaneous estimation of multiple causal pathways and outcomes, they noted that MT significantly increased the reinterpretation of pain sensations (Mean= 4.4, SD 5.5, $p < 0.001$) and improved IBS-related QoL (Mean = 11.2, SD 15.9, < 0.001).

Moreover, Zomorodi and colleagues conducted several studies aimed at IBS treatment. The researchers compared Cognitive Behavioral Therapy (CBT) and Mindfulness Therapy (MFT), and the control group in the study was carried out in 2014, which evaluated the Rome III score (Zomorodi et al. 2014a). The study comprised two groups - MFT (n=12) and CBT (n=12), which met the study's eligibility conditions. Rome III decreased considerably with MFT and was statistically significant. Another study by Zomorodi et al. (2014b) used the IBS-QoL scoring as the primary outcome in 36 subjects. The IBS-QoL is designed to evaluate the quality of life in individuals with IBS. This questionnaire consists of 34 questions, each with a 5-point response scale. The responses are summed and averaged to calculate a total score,

First author (year)	Population characteristics	Intervention	Comparison	Primary outcome measure scale	Study design	Main outcomes
Gaylord et al. (2011)	n= 75 female IBS patients according to ROME II Mean age (SD): MBSR: 44.72 (12.55) years Support Group: 40.89 (14.68)years	8-week MBSR+ medical therapy (n=36)	Support group + medical therapy (n=39)	IBS-SSS	RCT	Reductions in IBS symptom severity immediately after training (26.4% vs. 6.2% reduction; p< 0.006) and at 3-month follow-up (38.2% vs. 11.8%; p< 0.001) relative to SG.
Garland et al. (2012)	n= 75 female IBS patients according to ROME II Agein years (N/%) MBSR: <30: 4 (11.1) 30-49: 17 (47.2) 50-64: 12 (33.3) 65-76: 3 (8.3) Support group: <30: 11 (28.9) 30-49: 14 (36.8) 50-64:10 (26.3) 65-76: 3 (7.9)	8-week MBSR + medical therapy (n=39)	Support group + medical therapy (n=36)	IIBS-SSS	RCT	Pre-post treatment changes in clinical outcomes Mean-difference (SD): -82(97.1). (p<0.0011).
Zernicke et al (2013)	n= 90 IBS patients, according to Rome III criteria. Mean age (SD): MBSR: 44 (12.4) years Waitlist: 46 (12.6)years Sex (n/%) Female MBSR:40 (90.3) Waitlist: 41 (87.2) Male(n/%) MBSR:3 (7.0) Waitlist: 6 (12.8)	8-week MBSR n=43	Waitlist n=47	IBS-SSS	RCT	The improvement in the MBSR group pre-post intervention (p<0.0001). QoL improved pre-post intervention (p<0.001).
Zomorodi et al. (2014a)	n= 36 (24 IBS patients according to ROME III and 12 healthy subjects, of both genders) Mean age (SD): MFT: 34.2 (4.16) years CBT: 29.4 (5.82) years Control Group: 33.42 (5.3) Sex (n/%) Female: MFT:6 (50) CBT: 5 (48) Control Group: 5 (48) Male: MFT:6 (50) CBT: 7 (59) Control Group: 7 (59)	MFT (n=12) vs CBT (n=12)	Control Group (n=12)	IBS Questionnaire based on ROME III criteria	RCT	Mean-difference**: 5.199 (p<0.002) MFT reduces IBS symptoms compared to CBT and control groups. Long-term reduction in IBS symptoms among MFT and CBT compared to the control group (p < 0.005). No significant difference was observed between CBT and the control group.
Zomorodi et al. (2014b)	n= 36 (24 IBS patients according to ROME III and 12 healthy subjects, of both genders) Mean age of the patients: 32.36 (5.4) years*	MFT (n=12) vs CBT (n=12)	Control Group (n=12)	IBS Questionnaire based on ROME III criteria and IBS-QoL	RCT	MFT vs Control Mean difference (Total symptom test)**:- 5.136 (p<0.002). MFT vs Control Mean difference (Total QoL post-test)**:- 28.437 p<(0.000). MFT is more effective than CBT in reducing IBS symptoms and improving IBS-QoL and (p < 0.05).

Table 2: Characteristics of the included studies.

Zomorodi et al. (2015)	n= 24 IBS patients according to ROME III, of both genders Mean age in years(SD): MFT: 34/25 (4/16) Control Group: 33/42 (5/3) Sex: Female (N°/%) MFT: 6(50) Control Group: 5(48) Male(N°/%) MFT: 6(50) Control Group: 7(59)	8- weeks MFT + medical therapy (n=12)	Control Group (n=12)	IBS-QoL 34 questionnaires	RCT	Mean-difference**: 16.848 (P<0.010).
Ghandi et al. (2018)	n= 24 IBS patients according to Rome IV criteria Sex*** Females: 13 (54.2%) Males: 11 (45.8%).	MBSR (1) + ER (6)	Control Group	IBS-QoL 34 questionnaires	RCT	MBSR mean difference Baseline-follow up: -13.69 (p<0.05).
Mohamadi J. et al. (2019)	n= 76 IBS patients according to Rome IV criteria Mean Age (SD) DBT: 30.68 (3.07) years MBCT: 28.60 (3.20) years PPT: 28.76 (5.01) years Control:29.8 (4.51) Sex (n/%) Females DBT: 13 (54) MBCT: 11(55.0) PPT: 9(52.0) Control: 8(50.0) Males DBT:8 (50.0) MCBT: 9 (45) PPT:8 (47)	DBT (n=18) vs MBCT (n=20) vs PPT (n=18)	Control group (n=20)	IBS - QoL and PSS	RCT	Mean Difference PS (MBCT): -0.09. Mean Difference QoL (MBCT): -0.43. (P<0.05).
Henrich et al. (2020)	n= 67 female IBS patients according to ROME III criteria Mean Age (SD): MBCT: 35.58 (13.73) years Waitinglist: 35.48 (14.71) years	6-weeks MBCT (n = 36)	Waitlist group. (n=31)	GSRS IBS	RCT	Improvements in IBS symptom severity (p<0.003) and QoL (p<0.001).

RCT: Randomised Clinical Trial. **IBS-SSS:** IBS Symptom Severity Score. **IBS - QoL:** IBS-Quality of Life. **MBSR:** Mindfulness-Based Stress Reduction. **SD:** Standard Deviation. **MBT:** Mindfulness-Based Therapy. **CBT:** Cognitive Behavioral Therapy. **MFT:** Mindfulness Therapy. **DBT:** Dialectical Behavioral Therapy. **PPT:** Positive Psychotherapy. **ER:** Emotion Regulation. **MBCT:** Mindfulness-Based Cognitive Therapy. **PSS:** Perceived stress scale. * The authors did not inform the mean age by group or sex (gender). ** The authors did not inform the standard deviation. *** The authors did not inform about the age of the participants or their sex (gender) or the stratified per group.

Table 2: Characteristics of the included studies.

Unique ID	Comparator	Randomization process	Deviations from intended interventions	Missing outcome data	Measurement of the outcome	Selection of the reported results	Overall Bias
Garland, 2012	IBS-SSS	Some concerns	High	Low	High	High	High
Gaylord, 2011	IBS-SSS	Some concerns	Some concerns	Low	Some concerns	Some concerns	High
Ghandi, 2018	IBS-QoL34	Low	Some concerns	High	High	Some concerns	High
Henrich, 2020	GSRS IBS	Some concerns	High	Low	Some concerns	Some concerns	High
Mohamadi, 2019	IBS-QoL34	Some concerns	High	High	High	Some concerns	High
Zernicke, 2012	IBS-SSS	Low	Low	High	Low	High	High
Zomorodi, 2014a	IBS-SSS	Some concerns	High	High	High	Some concerns	High
Zomorodi, 2014b	IBS-QoL34	Some concerns	Some concerns	Some concerns	High	Low	High
Zomorodi, 2015	IBS-QoL34	High	High	Low	Some concerns	Some concerns	High

Table 3: Assessment of bias, detail.

then transformed to a scale between 0 and 100. The IBS-QoL allows researchers to measure the impact of IBS on the patient's overall well-being and quality of life. The study demonstrated that MFT had a more significant effect on IBS-QoL than CBT (Zomorodi et al., 2014b). Zomorodi et al. (2015) conducted a different RCT with 24 IBS patients and determined that MFT has long-lasting implications on life quality.

Zernicke et al. (2013) studied the benefit of Mindfulness-Based Stress Reduction (MBSR). This research revealed a notable reduction in symptoms among IBS patients when compared to a waitlist group, shifting them from a severe to a moderate range. Additionally, both groups demonstrated enhancements in mood, quality of life, and spirituality as time progressed.

Ghandi et al. (2018) also compared MBSR to group therapy based on emotional regulation and a control group. The comparison of the QoL scores between MBSR and control at the pretest and posttest revealed an increase in posttest scores in the MBSR group. The between-group comparison revealed a statistically significant difference between MBSR and control groups at follow-up ($p < 0.01$).

In turn, Henrich et al. (2020) studied 75 female patients with IBS, comparing Mindfulness-Based Cognitive Therapy (MBCT) with a waitlist control group through GSRS-IBS assessment. This 15-item questionnaire evaluates reflux, abdominal pain, indigestion, diarrhea, and constipation in IBS patients. This scale provides valuable insights into the gastrointestinal symptoms experienced by individuals with IBS and allows researchers to gauge the effectiveness of interventions in alleviating these symptoms. Henrich et al. (2020) showed that MBCT for IBS reduced symptom severity and improved quality of life through enhanced self-referential processing and non-judgmental awareness. In Mohamadi et al. (2019) trial, 76 IBS patients were distributed into four groups: MBCT, Dialectical Behavior Therapy (DBT), Positive Psychotherapy (PPT), and a control group. The researchers used the Perceived Stress Scale (PSS), a widely used psychological instrument designed to measure an

individual's perception of stress in their life. It consists of several statements or questions that respondents rate on a Likert scale, indicating how often they have felt a certain way regarding the situations described. Responses are usually scored on a scale from 0 (indicating no stress) to 4 or 5 (indicating a high stress level). The results showed that MBCT significantly reduced PSS compared to DBT and PPT programs. DBT training had a more pronounced impact on perceived stress than MBCT and PPT groups. Conversely, PPT training emerged as the most effective treatment for improving the QoL variable compared to other interventions.

Risk of bias assessment

This study used the RoB2 Cochrane tool to assess the risk of bias of the studies. Although Ghandi et al. (2018) and Zernicke et al. (2013) reported on randomization, they did not specify the methodology used or whether they implemented a blinding procedure. For missing outcome data, Garland et al. (2012), Gaylord et al. (2011), and Henrich et al. (2020) disclosed withdrawing patients from their trials. Other studies should have mentioned this information, implying that they only considered individuals who completed the trials. Regarding the outcome measurement, the report about IBS-SSS and IBS-QoL was collected without blinding. Additionally, due to the omission of information, selection bias in the results cannot be ruled out (Table 3; Figure 2).

The studies selected exhibited varying degrees of clarity in reporting the risk of bias assessment criteria. The absence of crucial information on randomization, deviations from intended interventions, and missing outcome data are concerns. These factors can influence the results in a biased manner, and their omission from the papers makes it challenging to evaluate their impact.

Discussion

This mini-review identified 9 RCTs published between 2011 and 2020 that compared the effects of

mindfulness-based interventions with active and passive control groups in patients with IBS. The RCTs were analyzed as complete manuscripts to ensure proper quality assessment; there was no limitation in the type of mindfulness, bringing a broader perspective on the intervention. Most of these studies demonstrated the efficacy of mindfulness-based interventions in reducing IBS symptoms and improving QoL.

Similar results were found in a systematic review and meta-analysis done by Babos et al. (2022) evaluating the efficacy of meditation/mindfulness in improving symptom severity and QoL in patients with IBS. Babos et al. (2022) meta-analysis demonstrated statistically significant improvement in IBS-QoL in the mindfulness group ($p < 0.003$). For the spiritual scale, $p < 0.002$ was similar to the review's findings regarding IBS-QoL. However, for IBS-SSS, the standardized mean difference between the mindfulness and the control groups was not statistically significant ($p < 0.054$). Another meta-analysis that included 41 RCTs assessed the immediate, short-term, and long-term effects of psychotherapy for reducing gastrointestinal (GI) symptoms in adults with IBS. Although psychotherapy and mindfulness are different interventions, they share a common goal of addressing the emotional root causes of IBS. Laird et al. (2016) concluded that individuals undergoing psychotherapy experienced a significant reduction in GI symptoms compared to the control group, which was similar to our findings.

The quality assessment identified issues with the trial methodologies, including small sample sizes, high drop-out rates, compromised generalizability in some studies, and problems related to blinding, introducing biases that can affect the reliability of our findings. We acknowledge that blinding in these interventions may be challenging, and the lack of blinding should be considered a potential source of bias in the analysis. The external validity was compromised in Garland et al. (2012), Gaylord et al. (2011), and Henrich et al. (2020) studies as they exclusively evaluated female patients, which limits the generalizability of the results.

Therefore, while mindfulness shows promise in alleviating IBS symptoms and enhancing overall well-being, there is still work to be done. Future research endeavors should focus on overcoming the challenges posed by methodological limitations and ensuring generalizability, thus providing a solid foundation for mindfulness-based interventions as a valuable complement to IBS treatment.

Conclusion

While acknowledging the substantial biases and limited generalizability in the included studies, it is evident that additional robust evidence is indispensable to validate the effectiveness of mindfulness and its positive impact. Future research should prioritize meticulous bias reduction and incorporate a more diverse study population to enhance data quality and broaden the scope of applicability in this domain. Importantly, this review underscores that mindfulness holds promise in alleviating symptoms and improving the quality of life for individuals with IBS.

Funding

This research received no external funding.

Conflicts of Interest

The authors declare no conflict of interest.

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