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Exposure-based cognitive behavioral therapy with complementary awareness and emotional expression training for alleviating irritable bowel syndrome (IBS)

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ABSTRACT

Aim: The present study presents a new combined approach for the treatment of irritable bowel syndrome (IBS), in which the effect of Cognitive Behavioral Therapy (CBT) based on exposure to awareness and emotional expression on patients' symptoms is examined.

Background: IBS is one of the most common functional gastrointestinal diseases where psychological distress is an integral part of its presentation.

Methods: We performed a clinical trial study on 30 patients with IBS. They were divided into two groups receiving the intervention and waiting list control. All patients were evaluated by IBS quality of life scale, IBS severity score, hospital anxiety and depression scale and visceral sensitivity index in three stages: pre-test, pre-test, and one-month follow-up. Our treatment program for the intervention group (n=15) included 10 group sessions, every week for 90 minutes, based on an exposure-based cognitive behavioral therapy protocol. Also, they underwent three 90-minute sessions of an emotional expression and awareness training program.

Results: The mean age of the participants was 31.0±8.77 years old. No previous history of substance addiction, psychiatric, or neurologic diseases was seen. Twenty participants (66.7%) were single, twenty-three participants (76.7%) had a university degree, and 9 participants were unemployed. No significant difference was seen between the case and control groups regarding education, occupation, and marital status. All pairwise comparisons of pre-test, post-test, and follow-up IBS-QOL scores were significant between the two groups ($p<0.001$). Similarly, pre- and post-, and pre- and follow-up test differences for IBS-SSS and VSI were significantly different between the two groups.

Conclusion: Exposure-based CBT combined with emotional expression and awareness training could alleviate the IBS symptoms, reduce visceral sensitivity, and improve quality of life.

Keywords: Irritable bowel syndrome, Psychotherapy, Cognitive behavioral therapy, Complementary awareness, Emotional expression training.

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Introduction

Irritable Bowel Syndrome (IBS) is one of the most common functional gastrointestinal diseases, which is characterized by symptoms such as abdominal pain or discomfort and changes in bowel habits (1). A meta-

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analysis study on the global prevalence of IBS reported a range from 1.4% to 33.8% (2). IBS is more common in women than men, with women experiencing depression, anxiety, and a lower quality of life. Although its pathophysiological mechanism is unknown to some extent, it seems that sex hormones and gender differences can play an important role in the pathophysiology of IBS (3). IBS patients experience pain and discomfort during bowel movements as a result of complex stimuli, a wide range of cognitive, emotional, and behavioral factors, including learning and expectations about pain, which negatively impact their quality of life in terms of their health and prompt them to seek medical attention (4). Evidence suggests that psychological distress is an integral part of the presentation of IBS (5). Psychological factors such as anxiety related to gastrointestinal diseases, stress, depression, anxiety, and catastrophizing could exacerbate the severity of IBS symptoms (6-8). However, the gut-brain axis adequately justifies this two-way interaction. This axis is considered one of the most important causes of IBS (9). According to this view, it is better to understand this disease from a biopsychosocial perspective (10). According to this method, it has been established that interference in gut and central nervous system processing results in motility issues, alterations in mucosal, immunological, and microbial integrity, as well as visceral sensitivity and unpleasant feelings throughout the digestive tract. When psychological conditions such as anxiety and sadness are present, these symptoms worsen and persist. This suggests two-way interactions between the gut and the brain (11).

Gut-brain psychotherapies are effective interventions that can be effective on improving gut-brain disorders, painful symptoms, and psychological discomfort such as anxiety and depression (4, 12). The American Gastroenterological Association (AGA) suggested that gut-directed hypnotherapy, Mindfulness-Based Stress (MBS) reduction, Acceptance and Commitment Therapy (ACT), and Cognitive Behavioral Therapy (CBT) be considered routinely as part of a complementary management strategy for gut-brain disorders such as IBS (4). CBT is a brief psychotherapy that affects mood and physical symptoms in a cycle by modifying cognition and behavior with a focus on psychoeducation, relaxation strategies, cognitive restructuring, problem-solving, and exposure (13). Regarding its effect, it can be mentioned that psychological treatments work on cognitive processes such as cognitive sensitivity, central processing defects, and visceral anxiety (which are the characteristics of IBS), thus affecting the brain-gut axis, which results in the improvement of patient's symptoms (13).

Recently, some CBT models have been developed specifically for IBS with the aim of implementing cognitive and behavioral strategies. One of them is the three-system model of IBS based on Long's three-system model (14), which focuses on cognitions and behaviors related to the functioning of the digestive system (15). Cognitive Behavioral Therapy based on Visceral Exposure (CBT-IE) is another IBS treatment model that works on threatening appraisals of visceral feelings and anxiety about bodily sensations associated with IBS (16). Both of these models consider the stress caused by IBS symptoms as the cause of the continuation of this disease (17).

Recently, a relatively new treatment has been introduced to improve the psychological and physical performance of IBS patients under the name of emotional awareness and expression training, which helps patients deal with unpleasant and repressed emotions instead of suppressing emotions and avoiding them (Sabaei, 2024 #42). Existing CBT models for IBS primarily focus on cognitive restructuring and behavioral strategies related to symptom management (13-16). While these approaches address important aspects of IBS, they may not fully address the emotional component, which can significantly impact symptom severity and quality of life. The present study introduces a new combined approach that has been used for the first time in the treatment of IBS patients. In this approach, Exposure-Based CBT (CBT-IE) with Awareness and Emotional Expression (AEE), can affect the severity of symptoms, quality of life, as well as anxiety and depression in IBS patients.

Methods

Design

This Randomized Pretest, Posttest, Follow-up (RPPF) design was designed to evaluate the effectiveness of the intervention, and to answer two questions: (1) Do the treatment and control groups differ

in the extent of change from pretest to posttest? and (2) do the treatment and control groups differ in the extent of change from post-test to follow-up? Following recruitment and confirmation of eligibility, participants were randomly assigned to either the intervention group (n=15) or the waitlist control group (n=15) using a computer-generated randomization sequence. Allocation concealment was ensured by keeping the randomization sequence in a sealed envelope until after baseline assessments were completed. Blinding was not possible due to the nature of the intervention; however, outcome assessors were blinded to group allocation (18). So, the researchers specified the characteristics of the study group and decided to measure the subjects' characteristics in the five variables of severity of IBS symptoms, anxiety, depression, quality of life, and anxiety specific to abdominal as well as intestinal symptoms. The wait list control engaged only in their usual care during the trial. The patients in the intervention group underwent exposure-based cognitive behavioral therapy for 10 sessions in a group format. Thereafter, 3 weekly training sessions on awareness and emotional expression were also implemented. This group also received conventional drug treatment. Both the intervention group and the control group were allowed to continue their usual care regimens, which may have included medications prescribed by their physician. After the sessions, a post-test was given to all the participants in the intervention and wait list control groups. The participants were also followed up with one month later. The study was approved by the ethics committee of University of Social Welfare and Rehabilitation Sciences (code: IR.USWR.REC.1400.304). The study was also registered at the clinical trial center (code IRCT20230626058587N1).

Subjects

Individuals who visited a gastroenterologist and were diagnosed with IBS were referred to a researcher. A total of 53 patients were referred, of whom 11 did not meet the inclusion criteria and were not entered into the study. Additionally, 12 patients declined to participate after being informed about the study conditions. Thirty subjects interested in participating in this study were recruited by referral from a gastroenterologist. The inclusion and exclusion criteria were applied by first obtaining a medical history from the patient by a gastroenterologist and then conducting a clinical interview by a psychologist. The inclusion criteria were as follows: fulfilling ROME-IV criteria for IBS, age 20-50 years old and signed inform consent. Exclusion criteria included: The presence of nocturnal symptoms, bloody stools, a family history of colon cancer, more than two absences from psychotherapy sessions as well as non-cooperation and failure to complete specified assignments, having a history of severe psychiatric illness (schizophrenia, bipolar disorder, major depression), a history of drug addiction and alcohol over the last 2 years, and a history of neurological diseases.

Measures

All 30 subjects completed five self-report questionnaires before starting the treatment as a pre-test including: Irritable Bowel Syndrome-Quality of Life Measure (IBS-QOL) (19), The Irritable Bowel Syndrome Symptom Severity Score (IBS-SSS) (20), Hospital Anxiety and Depression Scale (HADS) (21), and The Visceral Sensitivity Index (VSI) (22). These tests were repeated after the intervention and one month later in the follow up stage. The IBS-SSS gauges the severity of IBS symptoms, detecting changes over time with a maximum score of 500 and categorizes severity into normal, mild, moderate, and severe based on specific score ranges. A clinically significant change is marked by a 50-point difference from the baseline. The VSI evaluates anxiety related to IBS symptoms using a 15-item scale with a six-point Likert scale. It has demonstrated good internal consistency (Cronbach's alpha 0.93) and strong validity across several domains. IBS-QOL, developed by Patrick and Drossman in 1988, assesses the quality of life in IBS patients with an internal consistency coefficient of 0.94, comprising 34 questions across eight subscales rated on a 5-point Likert scale. Each of these instruments has been validated for their respective constructs, ensuring the reliability and accuracy of the data collected in this study.

Treatments

Treatment 1

Psychotherapy was conducted by a psychologist with a doctoral degree, certified by the Psychology and Counseling Organization, at a psychology and counseling clinic in the city of Arak. The treatment program consisted of 10 weekly group sessions, each lasting 90 minutes, following an exposure-based cognitive behavioral therapy protocol. According to the

theoretical model of IBS (Boersma, 2016 #44), this protocol targets false beliefs about IBS bodily sensations, attention to IBS bodily sensations, conditioned fear regarding these sensations, and maladaptive behavioral responses to IBS. The content of each session is outlined as follows: Session 1: Education about IBS and psychological stress about gastrointestinal function, raising awareness. Session 2: Training on the role of conditioning in IBS, attention training. Session 3: Attention training, cognitive restructuring for IBS sensations and risk estimation. Session 4: Cognitive restructuring for IBS symptoms, value estimation and hierarchy construction for IBS sensation reminders. Session 5: Cognitive reconstruction, assessment of visceral exposure and virtual exposure. Session 6-9: Guiding and directing visceral and virtual exposure. Session 10: Visceral exposure, virtual exposure, summary of all sessions, relapse prevention.

Treatment 2

In the second therapy, a group of patients underwent three 90-minute sessions of an emotional expression and awareness training program. This intervention's goal is to assist patients in reducing stress through: 1-Education of the relationship between stressful life events and physical symptoms. 2. Learning the ability to recognize, experience, and express emotions associated with these trying circumstances. 3. Encouraging patients to engage in positive interpersonal and emotional behaviors every day, such as direct and honest conversation. Patients first discussed their life history during these sessions, which helped them connect their IBS episodes to past events. The therapist then gave patients experiential exercises to aid them in confronting suppressed emotions, actions, memories, and connections. Finally, it was urged that patients express themselves more honestly in their relationships.

Sample size

To calculate the sample size for comparing two independent groups, such as in a randomized controlled trial, the following formula is typically used:

$$N = 2 \times \left(\frac{z_{1-\alpha} + z_{1-\beta}}{\delta_0} \right)^2 \times s^2$$

where Zσ/2 is the critical value for the significance level (typically 1.96 for α=0.05 (in a two-tailed test), Zβ denotes the critical value for the desired power (usually 0.84 for 80% power), δ0 (=0.5) represents the effect size, and S (=1) is standard deviation. Thus, the sample size needed per group has been approximately 32. However, due to practical constraints, we were only able to include 30 participants in each group.

Statistical analysis

The effectiveness of the intervention was evaluated by analyzing pre-test, post-test, and follow-up scores on the IBS-QOL, IBS-SSS, VSI, and HADS using a mixed-model ANOVA. This analysis involved group (intervention vs. control) as the between-subjects factor and time (pre-test, post-test, follow-up) as the within-subjects factor. The main effects of group and time, as well as the interaction effect between group and time, were assessed. Significant interaction effects would have indicated differential changes in outcome measures between the intervention and control groups across time points. Post-hoc analyses with appropriate correction for multiple comparisons would have been conducted to explore any significant main or interaction effects. All analyses were conducted using SPSS (version 27). P-values less than 0.05 were considered as statistically significant.

Results

Patients characteristics

This study consisted of 30 participants with the diagnosis of IBS, categorized into two groups of case and control, with 15 participants each (Table 1). All participants in this study were females with no previous history of substance addiction, psychiatric problems, or neurologic diseases. Twenty participants (66.7%) were single, with 11 in the control group. Twenty-three participants (76.7%) had a university education, with 12 being in the control group. Further, unemployment was seen in 9 participants, with 7 of them being in the control group. No significant difference was seen between the case and control group regarding education (p-value= 1.0), occupation (p-value= 0.134), and marital status (p-value = 0.350).

Main effects of intervention on questionnaire scores

The intervention group presented significant improvements in several measures compared to the waitlist control group (Table 2). At the baseline, both

Table 1. Patients Characteristics

Variable	Level	Total (n=30)	Group		P value
			Control (n=15)	Intervention (n=50)	
Age	----	31.00 ± 8.78	28.53 ± 6.91	33.47 ± 9.94	0.126
Sex	Female	30 (100%)	15 (100%)	15 (100%)	----
	Male	----	----	----	
Education	College	7 (23.30%)	3 (20.00%)	4 (26.70%)	1.000
	University	23 (76.70%)	12 (80.00%)	11 (73.30%)	
Marital Status	Single	20 (66.70%)	11 (73.30%)	9 (60.00%)	0.700
	Married	10 (33.30%)	4 (26.70%)	6 (40.00%)	
Occupation	Unemployed	9 (30.00%)	7 (46.70%)	2 (13.30%)	0.119
	Internship	10 (33.30%)	3 (20.00%)	7 (46.70%)	
	Retired	1 (3.30%)	----	1 (6.70%)	
	Self-employed	4 (13.30%)	3 (20.00%)	1 (6.70%)	
	Homemaker	6 (20.00%)	2 (13.30%)	4 (26.70%)	
Addiction	No	30 (100%)	15 (100%)	15 (100%)	----
	Yes	----	----	----	
Psychiatric History	No	30 (100%)	15 (100%)	15 (100%)	----
	Yes	----	----	----	
Neurological History	No	30 (100%)	15 (100%)	15 (100%)	----
	Yes	----	----	----	

Table 2. IBS-QOL, IBS-SSS, HADS, and VSI scores

Questionnaire	Wait list control	Mean	SD	Questionnaire	intervention	Mean	SD	p-value
	Age	28.53	6.91		Age	33.47	9.94	0.126
IBS-QOL	Pre-	43.77	17.47	IBS-QOL	Pre-	63.24	18.37	0.006**
	Post-	50.78	20.29		Post-	43.24	18.94	0.301
	F/u	51.42	21.49		F/u	38.43	19.19	0.092
IBS-SSS	Pre-	231.80	48.99	IBS-SSS	Pre-	319.00	59.32	<0.001***
	Post-	253.00	60.44		Post-	200.00	81.85	0.053
	F/u	254.00	59.47		F/u	193.67	80.01	0.026*
HADS - Anxiety	Pre-	10.13	1.96	HADS - Anxiety	Pre-	12.07	2.84	0.039*
	Post-	9.47	2.00		Post-	10.67	1.59	0.079
	F/u	9.53	2.00		F/u	10.67	1.84	0.117
HADS - Depression	Pre-	10.07	1.87	HADS - Depression	Pre-	10.53	1.68	0.479
	Post-	9.80	3.03		Post-	9.60	1.18	0.813
	F/u	9.73	2.76		F/u	9.67	1.50	0.935
VSI	Pre-	42.20	15.38	VSI	Pre-	30.47	12.34	0.029*
	Post-	36.80	14.79		Post-	48.20	17.70	0.066
	F/u	37.80	15.37		F/u	50.07	16.76	0.046*

SD: Standard Deviation; IBS-QOL: Irritable bowel syndrome – Quality of life; IBS-SSS: Irritable bowel syndrome – severity scoring system; HADS: Hospital anxiety and depression scale; VSI: visceral sensitivity index; Pre-: Pretest; Post-: Post-test; F/u: Follow-up; *: p-value <0.05, **p-value<0.01, ***p-value<0.001

groups had similar scores on all questionnaires. Patients in the intervention group reported a significantly better quality of life (IBS-QOL) at pre-test compared to the control group (p=0.006). While both groups' IBS symptom severity (IBS-SSS) worsened after the intervention, the intervention group showed a greater improvement compared to controls at follow-up (p=0.026). Similarly, anxiety scores (HADS-Anxiety) were significantly lower in the intervention group at pre-test (p=0.039), but did not differ significantly at the follow-up. Interestingly, pre-test visceral sensitivity (VSI) scores were lower in the intervention group compared to controls (p=0.029), but this difference did not persist at the follow-up (p=0.046). No significant differences were observed in depression scores (HADS-Depression) between the groups at any time point.

Changes over time: pre-, post-, and follow-up differences

Differential changes over time were assessed using difference scores between pre-test, post-test, and

Table 3. IBS-QOL, IBS-SSS, HADS, and VSI pre-, post-, and follow-up difference scores

Quest.	Wait list control	Mean	SD	Quest.	intervention	Mean	SD	p-value
IBS-QOL	Pre- and Post	-7.01	9.95	IBS-QOL	Pre- and Post	20.00	16.39	<0.001***
	Post- and F/u	-0.64	2.65		Post- and F/u	4.80	4.00	<0.001***
	Pre- and F/u	-7.65	10.33		Pre- and F/u	24.80	17.95	<0.001***
IBS-SSS	Pre- and Post	-21.20	29.46	IBS-SSS	Pre- and Post	119.00	95.42	<0.001***
	Post- and F/u	-1.00	15.14		Post- and F/u	6.33	32.43	0.434
	Pre- and F/u	-22.20	31.12		Pre- and F/u	125.33	95.61	<0.001***
HADS - Anxiety	Pre- and Post	0.67	1.84	HADS - Anxiety	Pre- and Post	1.40	2.03	0.308
	Post- and F/u	-0.07	1.03		Post- and F/u	0.00	1.20	0.871
	Pre- and F/u	0.60	1.92		Pre- and F/u	1.40	2.13	0.289
HADS - Depression	Pre- and Post	0.27	1.71	HADS - Depression	Pre- and Post	0.93	1.71	0.295
	Post- and F/u	0.07	0.96		Post- and F/u	-0.07	0.88	0.695
	Pre- and F/u	0.33	1.63		Pre- and F/u	0.87	2.00	0.430
VSI	Pre- and Post	5.40	5.78	VSI	Pre- and Post	-17.73	9.41	<0.001***
	Post- and F/u	-1.00	4.86		Post- and F/u	-1.87	3.81	0.867
	Pre- and F/u	4.40	4.52		Pre- and F/u	-19.60	7.65	<0.001***

Quest: Questionnaire; SD: Standard Deviation; IBS-QOL: Irritable bowel syndrome – Quality of life; IBS-SSS: Irritable bowel syndrome – severity scoring system; HADS: Hospital anxiety and depression scale; VSI: visceral sensitivity index; Pre-: Pretest; Post-: Post-test; F/u: Follow-up; *: p-value <0.05, **p-value<0.01, ***p-value<0.001

Table 4. Assessing Intervention effectiveness using pre-, post- and follow-up scores of IBS-QOL, IBS-SSS, HADS, and VSI questionnaires

Pairs	Mean	SD	p-value
intervention			
Pretest and Post-test IBS-QOL	20.00	16.39	<0.001***
Pretest and Follow-up IBS-QOL	24.80	17.95	<0.001***
Pretest and Post-test IBS-SSS	119.00	95.42	<0.001***
Pretest and Follow-up IBS-SSS	125.33	95.61	<0.001***
Pretest and Post-test HADS Anxiety	1.40	2.03	0.018**
Pretest and Follow-up HADS Anxiety	1.40	2.13	0.023*
Pretest and Post-test HADS Depression	0.93	1.71	0.053
Pretest and Follow-up HADS Depression	0.87	2.00	0.115
Pretest and Post-test VSI	-17.73	9.41	<0.001***
Pretest and Follow-up VSI	-19.60	7.65	<0.001***
Wait list control			
Pretest and Post-test IBS-QOL	-7.01	9.95	0.016*
Pretest and Follow-up IBS-QOL	-7.65	10.33	0.012*
Pretest and Post-test IBS-SSS	-21.20	29.46	0.015*
Pretest and Follow-up IBS-SSS	-22.20	31.12	0.015*
Pretest and Post-test HADS Anxiety	0.67	1.84	0.182
Pretest and Follow-up HADS Anxiety	0.60	1.92	0.246
Pretest and Post-test HADS Depression	0.27	1.71	0.556
Pretest and Follow-up HADS Depression	0.33	1.63	0.442
Pretest and Post-test VSI	5.40	5.78	0.003**
Pretest and Follow-up VSI	4.40	4.52	0.002*

SD: Standard Deviation; IBS-QOL: Irritable bowel syndrome – Quality of life; IBS-SSS: Irritable bowel syndrome – severity scoring system; HADS: Hospital anxiety and depression scale; VSI: visceral sensitivity index; *: p-value <0.05, **p-value<0.01, ***p-value<0.001

follow-up evaluations (Table 3). Significant improvements were consistently noted in the intervention group across all measured domains: IBS-QOL ($p < 0.001$***), IBS-SSS ($p < 0.001$***), and VSI ($p < 0.001$***), reflecting sustained positive outcomes from intervention. These improvements in the intervention group were sustained at follow-up.

Intervention Effectiveness: Comparative Analysis

To further gauge intervention effectiveness, paired comparisons between pre-test, post-test, and follow-up scores were conducted (Table 4). Significant improvements in IBS-QOL, IBS-SSS, and VSI were consistently observed in the intervention group. In contrast, the control group exhibited fewer significant

improvements, particularly in IBS-QOL ($p < 0.05$) and VSI ($p < 0.01$), highlighting the differential outcomes between active intervention and standard care.

Subscale analysis of IBS-QOL: detailed changes

Subscale analysis of IBS-QOL scores (Table 5) revealed specific improvements in domains such as dysphoria, social reaction, interference with activity, health worry, body image, relationships, food avoidance, and sexual functioning. Each subscale demonstrated significant enhancements following the intervention ($p < 0.05$), showing the multifaceted benefits experienced by participants. In contrast, the control group showed limited improvements across these domains, with fewer subscales reaching statistical significance ($p > 0.05$).

Longitudinal assessment: pre-, post-, and follow-up subscale differences

Longitudinal assessment of IBS-QOL subscales (Table 6) confirmed sustained improvements in dysphoria, social reaction, interference with activity, health worry, body image, relationships, food avoidance, and sexual functioning among intervention participants ($p < 0.05$), highlighting enduring positive effects over time. Conversely, the control group demonstrated fewer significant changes across these

Table 5. IBS-QOL subscale pre-, post-, and follow-up differences

Subscale	Wait list control	Mean	SD	Subscale	intervention	Mean	SD	p-value
Dysphoria	Pre- and Post-	-2.33	2.97	Dysphoria	Pre- and Post-	7.27	6.79	<0.001***
	Pre- and F/u	-2.33	2.64		Pre- and F/u	8.20	7.09	<0.001***
	Post- and F/u	0.00	1.31		Post- and F/u	0.93	1.16	<0.001***
Social Reaction	Pre- and Post-	-1.33	2.19	Social Reaction	Pre- and Post-	3.33	3.72	<0.001***
	Pre- and F/u	-1.13	2.59		Pre- and F/u	4.00	3.64	<0.001***
	Post- and F/u	0.20	0.86		Post- and F/u	0.67	1.18	0.225
Interference with Activity	Pre- and Post-	-1.93	4.01	Interference with Activity	Pre- and Post-	6.20	4.51	<0.001***
	Pre- and F/u	-2.40	3.70		Pre- and F/u	7.67	4.50	<0.001***
	Post- and F/u	-0.47	1.30		Post- and F/u	1.47	0.99	<0.001***
Health Worry	Pre- and Post-	-0.93	1.44	Health Worry	Pre- and Post-	2.40	2.41	<0.001***
	Pre- and F/u	-0.80	1.32		Pre- and F/u	3.67	2.92	<0.001***
	Post- and F/u	0.13	0.74		Post- and F/u	1.27	1.39	0.011*
Body Image	Pre- and Post-	-0.73	3.43	Body Image	Pre- and Post-	2.33	2.97	0.014*
	Pre- and F/u	-0.87	3.18		Pre- and F/u	3.13	2.83	0.001*
	Post- and F/u	-0.13	1.25		Post- and F/u	0.80	0.94	0.028*
Relation	Pre- and Post-	-1.20	2.48	Relation	Pre- and Post-	2.87	2.95	<0.001***
	Pre- and F/u	-0.93	2.34		Pre- and F/u	3.73	3.51	<0.001***
	Post- and F/u	0.27	1.10		Post- and F/u	0.87	1.64	0.250
Food Avoidance	Pre- and Post-	-0.80	1.08	Food Avoidance	Pre- and Post-	1.27	2.37	0.005**
	Pre- and F/u	-1.20	1.21		Pre- and F/u	1.80	2.46	<0.001***
	Post- and F/u	-0.40	1.12		Post- and F/u	0.53	1.51	0.064
Sexual	Pre- and Post-	-0.27	1.49	Sexual	Pre- and Post-	1.53	2.53	0.025*
	Pre- and F/u	-0.73	1.91		Pre- and F/u	1.53	2.95	0.019*
	Post- and F/u	-0.47	0.92		Post- and F/u	0.00	1.20	0.240

Pre-: Pretest; Post-: Post-test; F/u: Follow-up; *: p-value <0.05, **p-value<0.01, ***p-value<0.001

subscales, reflecting the lesser impact of standard care on improving specific quality of life domains.

Discussion

The aim of this study was to evaluate whether CBT-IE along with AEE leads to the alleviation of IBS symptoms, quality of life, anxiety, depression, and visceral sensitivity. Overall, the results indicated that this intervention caused improvement and made a difference compared to patients who received only conventional treatment. The strongest and most consistent effects on improving IBS symptoms were quality of life and visceral tenderness. These results reinforce previous findings that CBT is an effective and promising treatment for IBS and its complications (23, 24).

The start of CBT-IE along with AEE for IBS patients has a positive effect on improving the symptoms of the disease and visceral sensitivity, with the follow-ups showing that the improvement is maintained, and a significant difference has been observed post-intervention compared with the group that received only conventional treatment. Also, CBT-IE along with AEE improves the quality of life, and based on the data obtained from this study, there has been a continuous improvement over the course of one month, and due to the positive trend, we will probably see it continue in the future.

The cognitive and behavior responses of patients to IBS symptoms affect intensification of their unpleasant abdominal and intestinal feelings and lead to a decline in their quality of life in the long term (13). To elucidate the mechanism of how CBT may be effective on reducing IBS symptoms, it has been proven that by changing how to deal with this disease, CBT treatment

Table 6. Assessing Intervention effectiveness using pre-, post- and follow-up scores of IBS-QOL subscales

Pairs	Mean	SD	p-value
Wait list control			
pretest post-test IBS-QOL dysphoria	-2.333	2.968	0.009**
pretest and Follow-up IBS-QOL Dysphoria	-2.333	2.637	0.004*
Pretest and Post-Test IBS-QOL Social Reaction	-1.33333	2.19306	0.034*
Pretest and Follow-up IBS-QOL Social Reaction	-1.13333	2.58752	0.112
Pretest and Post-test IBS-QOL Interference With Activity	-1.93333	4.00832	0.083
Pretest and Follow up IBS-QOL Interference With Activity	-2.40000	3.69942	0.025*
Pre-test and Post-test IBS-QOL Health Worry	-0.93333	1.43759	0.025*
Pre-test and Follow-up IBS-QOL Health Worry	-0.80000	1.32017	0.034*
Pretest and Post-Test IBS-QOL Body Image	-0.73333	3.43234	0.422
Pretest and Follow-up IBS-QOL Body Image	-0.86667	3.18179	0.309
Pretest and Post-test IBS-QOL Relationships	-1.20000	2.48424	0.082
Pretest and Follow-up IBS-QOL Relationships	-0.93333	2.34419	0.145
Pretest and Post-test IBS-QOL Food Avoidance	-0.80000	1.08233	0.013*
Pretest and Follow-up IBS-QOL Food Avoidance	-1.20000	1.20712	0.002*
Pretest and Post-test IBS-QOL Sexual	-0.26667	1.48645	0.499
Pretest and Follow-up IBS-QOL Sexual	-0.73333	1.90738	0.159
intervention			
pretest post-test IBS-QOL dysphoria	7.267	6.787	0.001**
pretest and Follow-up IBS-QOL Dysphoria	8.200	7.093	0.001**
Pretest and Post-Test IBS-QOL Social Reaction	3.33333	3.71612	0.004**
Pretest and Follow-up IBS-QOL Social Reaction	4.00000	3.64496	0.001**
Pretest and Post-test IBS-QOL Interference With Activity	6.20000	4.50714	<0.001***
Pretest and Follow up IBS-QOL Interference With Activity	7.66667	4.49868	<0.001***
Pre-test and Post-test IBS-QOL Health Worry	2.40000	2.41424	0.002**
Pre-test and Follow-up IBS-QOL Health Worry	3.66667	2.91956	<0.001***
Pretest and Post-Test IBS-QOL Body Image	2.33333	2.96808	0.009**
Pretest and Follow-up IBS-QOL Body Image	3.13333	2.82506	0.001**
Pretest and Post-test IBS-QOL Relationships	2.86667	2.94877	0.002*
Pretest and Follow-up IBS-QOL Relationships	3.73333	3.51460	0.001**
Pretest and Post-test IBS-QOL Food Avoidance	1.26667	2.37447	0.058
Pretest and Follow-up IBS-QOL Food Avoidance	1.80000	2.45531	0.013*
Pretest and Post-test IBS-QOL Sexual	1.53333	2.53170	0.034*
Pretest and Follow-up IBS-QOL Sexual	1.53333	2.94877	0.064

*: p-value <0.05, **p-value<0.01, ***p-value<0.001

helps patients to recognize the connection between the cycle of thoughts, emotions, and behaviors related to IBS as well as to change their perspective towards it in order to have a better coping strategy for their symptoms and improve the quality of life (25). Also changing the cycle of coping and behavior toward IBS by altering the process of the brain-gut axis leads to alleviation of psychological discomfort (26). In neurological studies, it has been found that CBT reduces neural activity in the hippocampal gyrus and right cingulate cortex, and by changing limbic activity, it mitigates abdominal symptoms and anxiety (27). Furthermore, it appears that when CBT leads to changes in symptoms through biological mechanisms, it mainly affects the brain component of the brain-gut axis. However, the impact of these brain changes on the rest of the brain-gut axis and symptom improvement remains unclear. Additionally, microbial signals, such as neuroactive metabolites including short-chain fatty acids and serotonin, may influence how effectively CBT generates biological effects (Jacobs, 2021 #43). A number of previous studies have indicated that CBT improves the level of anxiety, depression, QOL, and abdominal symptoms in patients with IBS (28-30). Everitt et al. (2019) in a 24-month follow-up demonstrated that patients receiving CBT therapy had a sustained improvement in the severity of IBS symptoms compared to the usual treatment group (24). According to a systematic review of the effect of CBT treatment, it helps to reduce the severity of gastrointestinal symptoms and improve quality of life by changing specific GI disease cognitions and the effect on specific anxiety (31).

CBT combined with exposure approaches has been reported to significantly improve IBS symptoms and quality of life, especially in people who are exposed to visceral sensitivity and adopt avoidance behaviors (32-34). We also clearly observed its positive effects by combining these approaches. The exposure approach reduces avoidance behaviors and makes patients consider their gastrointestinal symptoms less threatening, and as a result, their experience of pain as well as hypervigilance towards intestinal symptoms and visceral sensitivity diminish (13). People with functional gastrointestinal symptoms are more prone to panic disorder and agoraphobia than others (35). As a result, this approach, which is based on panic treatment, targets visceral anxiety with self-monitoring training plus cognitive restructuring and aids in the development of treatment. Craske et al. (16) confirmed that implementing the exposure intervention improved patients' intestinal symptoms.

In addition, we added awareness and emotional expression to our intervention. Adding these trainings to the CBT treatment allowed us to not only work on the patient's emotions and behavior, but also by involving them with their emotions, being aware of them, and expressing their emotions we could care for their conflicts and repressed experiences, since many IBS patients are coping with various types of trauma (36), early adverse life events (37), and interpersonal problems (38, 39). Previous studies have also demonstrated the positive effects of this trainings. Thakur et al. (2017) found that teaching emotional awareness and expression to IBS patients reduces their physical symptoms and improves their quality of life (40). Holmes et al. also stated that emotional expression can be beneficial for a wide range of IBS patients (41).

The present study found that CBT treatment does not create a significant difference between the wait list control and intervention groups in terms of anxiety and depression. However, visual inspection of the data showed improvements. Although the examination before and after CBT intervention in each group (case and control) indicated that drug treatment alone would not improve anxiety and depression symptoms, psychotherapy intervention does. Since we implemented emotional exposure and expression approaches along with CB treatment for patients, it is possible that due to lack of preparation of patients to deal with emotions, exposure to emotions in the short term would to a lack of improvement and may even elevate the level of anxiety and depression. Therefore, it is suggested to examine the patient's characteristics to choose the best treatment for IBS. Consistent with the results of this study, Windgassen et al. did not find anxiety and depression as key mechanisms of treatment effect in functional gastrointestinal diseases in their study. This indicates that anxiety and depression are unlikely to be directly responsible for functional GI (31).

Another point we found in this study is that the quality-of-life scores of the participants improved from the post-test to the follow-up. This suggests that the

person's learning during the sessions as well as mental exercises and working on it after the completion of the treatment (until the follow-up time) creates a significant difference in improving the quality of life without significant improvement in the symptoms of the disease along this time.

There have been some shortcomings in our study. First, differences in the baseline quality of life could be due to errors in randomization. Further, in this study, we did a relatively short follow-up, and it is suggested that future studies expand these follow-ups to several stages. In addition, based on the conditions of our patients, the training and emotional expression were limited to three sessions. In order to involve more patients with this approach, it is better to increase the number of sessions so that its effects on the level of anxiety and depression can be better measured. Also, we suggest a diverse sample size including a mix of men and women for future studies.

Conclusion

In conclusion, it is not surprising that psychological therapies constitute a successful therapy option for IBS considering the significance of brain-gut interactions and cognitive affective processes in the illness. Exposure-based CBT with emotional expression training has the potential to significantly improve both IBS symptoms and patients' quality of life as well as visceral sensitivity.

Conflict of interests

The authors declare that they have no competing interests.

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