

# Efficacy of cognitive behavioral therapy after the surgical treatment of women with endometriosis

## A preliminary case-control study

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### Abstract

**Background:** Regardless of unique status or symptoms, any woman with endometriosis is at risk of developing mental health issues such as anxiety and depression. Cognitive behavioral therapy (CBT) is an effective psychological treatment for depression, anxiety, and stress. The objectives of the study were to see whether usual care combined with CBT improves depression, anxiety, and stress in patients after surgery for endometriosis as compared to usual care alone.

**Methods:** Patients aged 18 to 50 years old with endometriosis who were scheduled for surgery were received usual care (Chinese martial arts) with CBT (1 pre-surgery and 6 post-surgery CBT sessions; Case or Intervention group, n = 48) or usual care only (Control group, n = 48). The demographic characteristics questionnaire was given to all individuals. Depression, anxiety, and stress were evaluated at baseline (within 24 hours after admission to the hospital) and postintervention (immediately before discharged) in both groups using the Chinese short version of Depression Anxiety and Stress scale (DASS-21).

**Results:** At postintervention DASS-21 scores for depression, anxiety, and stress of the case group and the control group were decreased as compared to baseline ( $P < .0001$  for all). At postintervention DASS-21 score for anxiety of the case group was decreased compared to the control group ( $P = .0091$ ). Usual care plus CBT significantly increased the number of females with no symptoms of depression as compared to baseline at postintervention(s) ( $P = .0356$ ). At postintervention(s), there was no female with extremely severe depression in both groups. Usual care plus CBT significantly decreased the number of females with symptoms of extremely severe anxiety as compared to baseline at postintervention(s) ( $P = .035$ ). Unlike the control group, in the case group, there were no females with extremely severe stress at postintervention.

**Conclusions:** females with endometriosis who had surgery reported high levels of depression, anxiety, and stress at the time of hospital admission. Patients with endometriosis can benefit from CBT.

**Abbreviations:** AWE = abdominal wall endometriosis, Case group = Women received one pre-surgery and 6 post-surgery cognitive behavioral therapy sessions in addition to their routine usual care, CBT = cognitive behavioral therapy, Control group = Women received routine usual care, DASS-21 = Chinese short version of Depression Anxiety and Stress scale, N = numbers of total females included in analysis, n = sample size, SD = standard deviation,  $\chi^2$ -test = chi-square test.

**Keywords:** anxiety, cognitive behavioral therapy, depression, endometriosis, non-treatment intervention, stress

## 1. Introduction

Endometriosis is a condition in which endometrial cells, including glands and stroma, are discovered outside the womb.<sup>[1]</sup> Endometriosis most commonly affects the ovaries, fallopian tubes, and tissue surrounding the uterus and ovaries, with the extra pelvic disease being uncommon.<sup>[2]</sup> Endometriosis, the extra pelvic disease is most prevalently developing in the abdominal

wall and by the name, and it is so-called abdominal wall endometriosis (AWE).<sup>[3]</sup> The incidence rate of AWE was recorded to be 0.03% to 3.5%.<sup>[4]</sup> AWE is a rare condition but the exact cause of this condition is not clear.<sup>[5]</sup> However, based on the pathogenesis, many theories have been postulated.<sup>[2,5]</sup> The most predominant symptoms observed are severe periodical pain with menstruation, hernias, abscesses, lipomas, desmoid tumors, and malignancies.<sup>[6]</sup> Endometriosis affects 10% to 15% of women

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The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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in their reproductive years and 70% of women with chronic pain of the pelvis, causing severe discomfort and a decreased quality of life.<sup>[1]</sup> It was estimated that 40% of the women with endometriosis lost their fertility.<sup>[7]</sup> After the surgery, endometriosis patients' quality of life improves but when compared it is not to the quality of life of a healthy woman.<sup>[8,9]</sup> A recent guideline on the management of endometriosis is included diagnosis and treatment for endometriosis-associated pain and infertility. However, the psychosocial impact of endometriosis is not addressed yet.<sup>[10]</sup>

Mediators in the quality of life include depression, anxiety, and stress.<sup>[11]</sup> Cognitive behavioral therapy (CBT) is an effective psychological treatment for depression, anxiety, and stress.<sup>[12]</sup> A survey for endometriosis is a good choice for alleviating long-term symptoms. The quality of life for endometriosis patients after surgery should be addressed, and we believe that CBT for endometriosis patients will improve their quality-of-life following surgery.

Experts in the field are currently investigating the link between endometriosis and the development of mental health problems such as anxiety and depression.<sup>[13]</sup> Endometriosis, along with its symptoms and experiences, has been linked to poor mental health and a lower quality of life in several studies.<sup>[13,14]</sup> This link is expected to be higher in women who do not have an understanding partner or support system, as well as those who have persistent or severe symptoms.<sup>[15]</sup> Regardless of her unique status or symptoms, any woman with endometriosis is at risk of developing mental health issues such as anxiety and depression.<sup>[13]</sup>

The objectives of the preliminary case-control study were to check whether usual care combined with CBT improves depression, anxiety, and stress in patients after surgery for endometriosis as compared to usual care alone.

## 2. Materials and Methods

### 2.1. Ethics approval and consent to participate

The study was approved by the Human Ethics Committee of Sichuan University (Approval number 1551SU dated June 15, 2020). Written informed consent was obtained from the patient or her guardian of all the participants before taking part in the study. The study follows the law of China and the V2008 Declarations of Helsinki.

### 2.2. Inclusion criteria

The study included female patients aged 18 to 50 years old with endometriosis (as determined by manual examinations, ultrasonography, magnetic resonance imaging, or laparoscopic surgery) and a surgical reason.<sup>[16]</sup>

### 2.3. Exclusion criteria

The study did not include any female patients who had been diagnosed with mood disorders or anxiety at the time of enrollment. Patients who were receiving psychological treatment or any form of pharmacological treatment for mood disorders were excluded from the trial. Women with incomplete data were excluded from the analysis.

### 2.4. Sample size calculations

PS-Power and the sample size calculator were used to calculate the sample size. Using a 1:1 ratio of independent sample *t* test with an  $\alpha$ -error of 0.05% and 80% power of the study (1-), with a suitable 8.5% difference (hypothesis) and standard deviation of 0.05.

$$\text{Sample size} = \frac{r+1}{r} \frac{(p^*)(1-p^*)(Z_{\beta} + Z_{\alpha/2})^2}{(p1-p2)^2}$$

$$= 2 + \frac{1}{2} \frac{(0.28)(1-0.28)(0.84+1.96)^2}{(0.39+0.17)^2}$$

$$= 96 \text{ women}$$

## 2.5. Randomization

To pick samples at our leisure, we used the consecutive sampling technique. A trial statistician with no clinical participation in the project chose 96 individuals (N) and randomly split them into the intervention group (n = 48) and the control group (n = 48) using a computerized random number generator. Pilot research should have 30 or more patients per group,<sup>[17]</sup> and the study subjects were 48 in each group enrolled here in the current study are consistent enough. This provides sufficient power to distinguish between 2 groups.

## 2.6. Non-treatment intervention(s)

Patients with endometriosis who were scheduled for surgery were randomly assigned to 1 of 2 groups: usual care with CBT (Case or Intervention group) or usual care only (Control group). Women in the intervention group received 1 pre-surgery and 6 post-surgery CBT sessions in addition to their routine usual care, to increase their quality of life. The women in the control group just receive standard treatment (usual care). A 6-month follow-up was conducted.

## 2.7. Usual care

Chinese martial arts, for example, Tai Chi was preferred by all patients. A session of 30 min/per day, 5 days a week was preferred by patients.

## 3. CBT

The goal of the cognitive intervention was to assist patients to gain enough knowledge about endometriosis surgery and therapy options. What is endometriosis? What causes endometriosis? Is endometriosis harmful? What are the signs and symptoms of endometriosis? What are the signs and symptoms of endometriosis? How is endometriosis diagnosed? Can endometriosis make you infertile? Is there a diet that can help with endometriosis? What is the treatment for endometriosis? Is it possible to exercise with endometriosis? Answering patients' inquiries straightforwardly and completely. The goal of the behavior intervention was to offer patients information about appropriate actions so that they may prepare themselves ahead of time. These included offering information on endometriosis knowledge and real-time endometriosis data, such as the number of patients who had been evaluated for endometriosis and their recovery status following surgery, and providing clear and complete answers to patients' questions. The goal of the behavior intervention was to provide knowledge on suitable behaviors that would aid patients in managing endometriosis. Self-protection activities such as following the surgery for a week, keeping the stools soft, drinking enough amounts of fluid (at least 700 mL/day), and eating foods that are easily digested (oatmeal, scrambled eggs, fruits, rice, yogurt, etc) and nothing to eat too oily or spicy were among them and encourage patients to use relaxing techniques such as music therapy and breathing exercises and to maintain close contact with family and friends. Patients in the intervention group were given this information and intervention. Participants were also required to keep a daily journal of their emotions and medical compliance. The described specific a CBT for endometriosis is our institutional protocol (not published yet).

### 3.1. Instruments

**3.1.1. Socio-demographic and clinical details.** The demographic characteristics questionnaire was given to all individuals who had been diagnosed with endometriosis and were awaiting surgery.

**3.1.2. Chinese short version of depression anxiety and stress scale (DASS-21).** Depression, anxiety, and stress were evaluated at baseline (within 24 hours after admission to the hospital) and postintervention (immediately before discharged) in both groups using the DASS-21.<sup>[18]</sup> A total of the 21-item scale was applied in both clinical and non-clinical settings. This was used to measure the negative emotions of females in the past week. There were 7 questions and all questions had grades of 0, 1, and 3. 0: non-conformity, 1: consistent, 3: very consistent. The higher the score, the worse the condition(s). Scores were multiplied by 2. The cutoff for severity levels of DASS-21 is as per Table 1.<sup>[19]</sup>

### 3.2. Statistical analysis

The statistical significance level was chosen at  $P = .05$ . The continuous variables of the depression, anxiety, and stress of DASS-21 scales in the intervention and control groups were provided as mean and standard deviation (SD) and  $n$  (percent). The mean differences of continuous variables were compared using a 2-sided  $t$  test or Mann-Whitney test, or Wilcoxon matched-pairs signed-ranks test. Chi-square-test ( $\chi^2$ -test) was employed to look at the statistical differences between the categorical data. Kolmogorov and Smirnov test was performed to check the normality of continuous variables.

## 4. Results

### 4.1. Study population

From July 1, 2020 to November 15, 2021, prospective, case-control research was conducted in the department of obstetrics and gynecology, the West China Second University Hospital of the Sichuan University, Chengdu, Sichuan, China, the Cancer department of traditional Chinese medicine, the Sichuan Cancer Hospital & Institute, Sichuan Cancer Center, School of Medicine, the University of Electronic Science and Technology of China, Chengdu Sichuan, China, and the department of obstetrics and gynecology, the General Hospital of Western Theater Command PLA, Chengdu, Sichuan, China. Cluster sampling was used to recruit all participants. Seventeen females were withdrawn from the study out of a total of 113 participants. Females did not drop out after baseline evaluation. All females in both groups receive the intervention without missing a single session and without delay. All the participants expressed

an interest in taking part in the study. The summary chart of the study is presented in Figure 1.

### 4.2. Outcome measures

**4.2.1. Socio-demographic and clinical details.** The socio-demographic and clinical details of the research samples are shown in Table 2. Based on age, educational levels, domicile, occupation, and other characteristics, the intervention, and control groups were quite similar at baseline ( $P > .05$  for all,  $t$  test, Mann-Whitney test, or  $\chi^2$ -test). The intervention group was 46.0 years old, while the control group was 47.2 years old. In terms of educational attainment, the intervention group had 27% middle education and the control group had 31% middle education. Furthermore, rural areas are home to 27% of the intervention group and 33% of the control group. Twelve percent of the intervention group was unemployed, while 17% of the control group was unemployed. Almost half of the participants in both the intervention and control groups were married (46% and 43%, respectively). Also, the DASS-21 scores for depression, anxiety, and stress were statistically similar between both cohorts at baseline ( $P > .05$  for all,  $t$  test, or Mann-Whitney test).

**4.2.2. DASS-21.** At postintervention DASS-21 scores for depression (Fig. 2), anxiety (Fig. 3), and stress (Fig. 4) of the case group and the control group were decreased as compared to baseline ( $P < .0001$  for all, Wilcoxon matched-pairs signed-ranks test, for all). At postintervention DASS-21 score for depression ( $P = .3789$ , Wilcoxon matched-pairs signed-ranks test) and stress ( $P = .9223$ , Wilcoxon matched-pairs signed-ranks test) of the case group were the same as compared to the control group. At postintervention DASS-21 score for anxiety of the case group was decreased compared to the control group ( $P = .0091$ , Wilcoxon matched-pairs signed-ranks test).

At postintervention(s), there was no female with extremely severe depression in both groups. Unlike usual care alone, usual care plus CBT significantly increased the number of females with no symptoms of depression as compared to baseline at postintervention(s). The details for different severity levels of the DASS-21 score for depression are presented in Table 3.

Unlike usual care alone, usual care plus CBT significantly decreased the number of females with symptoms of extremely severe anxiety as compared to baseline at postintervention(s). Also, usual care plus CBT significantly decreased the number of females with symptoms of extremely severe anxiety at postintervention as compared to usual care only but this was not statistically significant. In the control group number of females with mild anxiety increased at postintervention but this was not statistically significant. The details for different severity levels of the DASS-21 score for anxiety are presented in Table 4.

Unlike the control group, in the case group, there were no females with extremely severe stress at postintervention. The number of females with mild stress was increased and those with severe stress was decreased in the control group at postintervention as compared to baseline. However, these were not statistically significant. The details for different severity levels of the DASS-21 score for stress are presented in Table 5.

## 5. Discussion

According to our findings, females with endometriosis who had surgery reported high levels of depression, anxiety, and stress at the time of hospital admission. These results of the current study are in line with previous findings.<sup>[7,8]</sup> To our knowledge, this is the first prospective study to examine the effectiveness of CBT in lowering depression, anxiety, and stress in endometriosis patients who had surgery in China. Females with endometriosis have issues of mental health.

**Table 1**  
The cutoff for severity levels of the Chinese short version of Depression Anxiety and Stress scale used in the study.

Severity level	Chinese short version of Depression Anxiety and Stress scale score		
	Depression	Anxiety	Stress
Normal	≤9	≤7	≤14
Mild	10–13	8–9	15–18
Moderate	14–20	10–14	19–25
Severe	21–27	15–19	26–33
Extremely severe	≥28	≥20	≥34

A total of 7 questions and all questions had grades of 0, 1, and 3. 0: non-conformity, 1: consistent, 3: very consistent. The higher the score, the worse the condition(s). Scores were multiplied by 2.

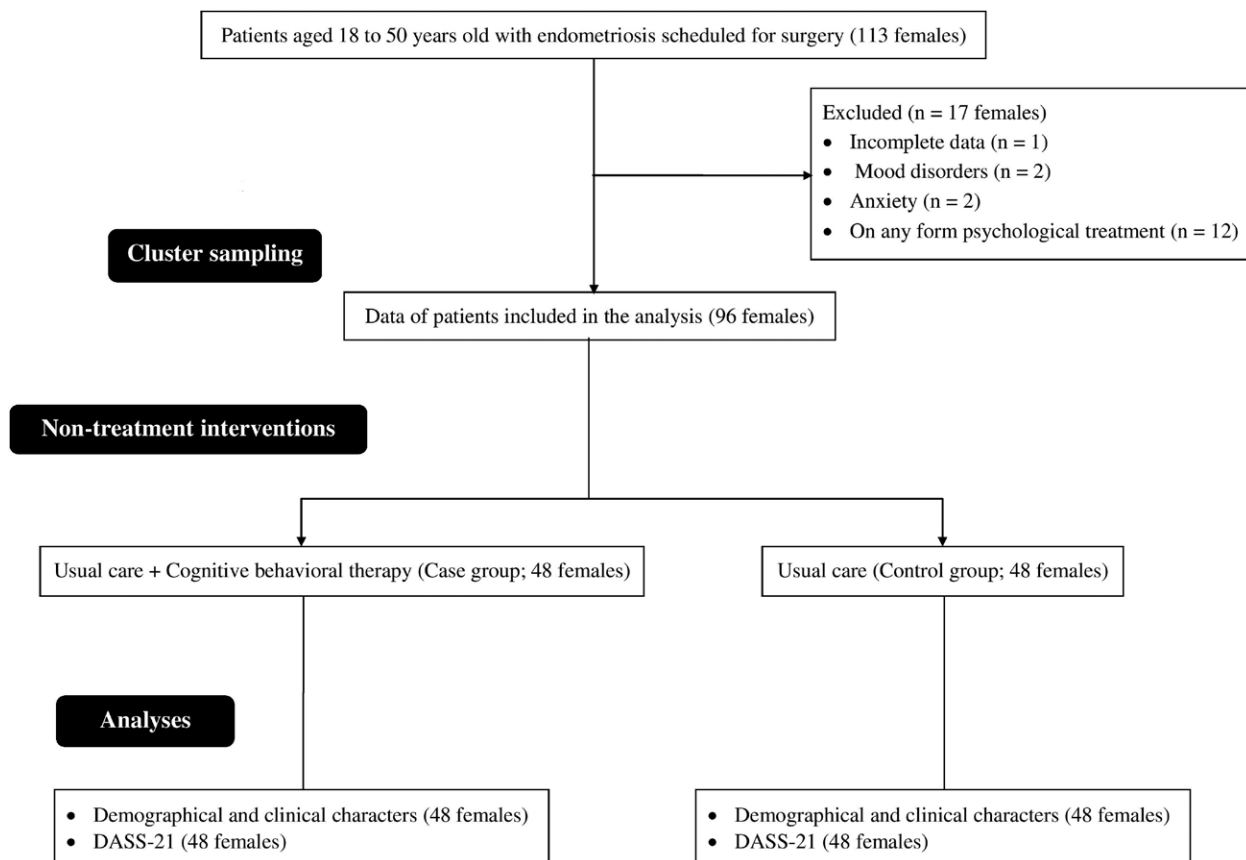


Figure 1. The summary chart of the study.

Our findings show that following non-treatment intervention, depression, anxiety, and stress, of DASS-21 scores, mean values in both intervention and control groups dropped significantly. Females in the intervention group, on the other hand, had a higher mean reduction in anxiety scores for DASS-21. These findings of the current study are consistent with a thorough meta-analysis<sup>[12]</sup> and those of reviews of psychological and mind-body endometriosis therapies.<sup>[20,21]</sup> CBT has been proposed as a first-line treatment for people suffering from mental illnesses<sup>[22]</sup> based on numerous research indicating that CBT is the most effective method of treatment in lowering depression, anxiety, and stress symptoms.<sup>[12]</sup> The findings of the current study show that CBT is useful in improving psychological health in endometriosis patients who have had surgery.

Throughout the intervention, we discovered that providing patients with enough information on endometriosis and its management greatly reduced their negative emotions. We thought that receiving enough information on endometriosis was the key reason for patients improved psychological health following CBT intervention and detailing the measures to be followed surgery, as well as they, were able to self-monitor their health state and get timely clinical therapy, as found in previous studies.<sup>[8,13]</sup> All these factors may play a role in the patient's cognitive repair process, in which problematic thought patterns are continually addressed, resulting in increased self-confidence and self-efficacy and a reduction in psychological distress.<sup>[22]</sup> Providing patients with enough information on endometriosis improves their psychological health.

Behavior interventions, such as self-protection skills like keeping stools soft, drinking plenty of water, and eating foods that are easy to digest and not too greasy or spicy, as well as relaxation techniques like music therapy and breathing relaxation, may help patients reduce their anxiety, depression, and stress symptoms. "Listening to pleasant music has been shown

to increase emotional self-regulation, executive function, and cognition in previous studies."<sup>[20,21]</sup> "Emotion processing in cortical and subcortical regions can be triggered, increasing dopamine secretion, a decrease in cortisol secretion, and a reduction in stress and stress-related health conditions."<sup>[21]</sup> "Breathing relaxation training has been proven in studies to reduce sympathetic tone and improve parasympathetic output, which counteracts increased sympathetic activities under stress."<sup>[23]</sup> As a result, negative feelings like depression anxiety, and stress will be decreased.<sup>[24]</sup> Providing patients of endometriosis with behavior interventions improve their psychological health.

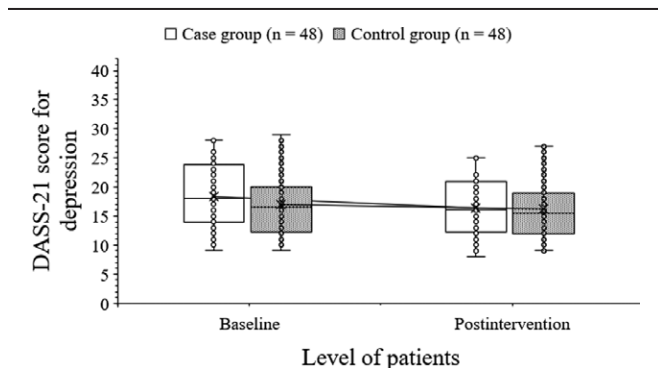
Depression, anxiety, and stress scores of DASS-21 were decreased in both groups. We feel that patients who have regular contact with family and friends,<sup>[25]</sup> as well as support from medical personnel,<sup>[26]</sup> are more likely to improve their mental health. Previous research has shown that these measures help boost a patient's self-esteem while also reducing the psychological stress induced by endometriosis surgery.<sup>[20,21]</sup> The addition of CBT to usual care may also have a substantial influence on patients' physical and psychological well-being.

The study's main strength is that it is the first prospective study to use a rigorous study design and methodology to examine the effectiveness of CBT in improving psychological health for patients after endometriosis surgery. Second, all participants completed the whole study (apart from 17 females who dropped out from the study due to various reasons(s)), ensuring data consistency. Finally, the healthcare team who administered CBT underwent a special training program and followed the protocol without any deviations, with a psychological specialist guiding and supervising the entire CBT intervention process. There are, however, some limits that must be acknowledged. The intervention time is relatively brief, and after the participants are discharged, there is no long-term follow-up, which is

**Table 2**  
**Socio-demographic and clinical details of enrolled patients at baseline.**

Parameters	Groups			Comparisons of groups
	Non-treatment intervention(s)	Case group Usual care + Cognitive behavioral therapy	Control group Usual care	
Numbers of females		48	48	<i>P</i> value
Age (yrs)	Minimum	18	18	.065 (Mann-Whitney test)
	Maximum	50	50	
	Median	46	47.2	
Education	Primitive	20(42)	21(44)	.7786 ( $\chi^2$ -test)
	Middle	13(27)	15(31)	
	Higher	15(31)	12(25)	
		43(90)	45(94)	
Ethnicity	Han Chinese	43(90)	45(94)	.552 ( $\chi^2$ -test)
	Mongolian	4(8)	3(6)	
	Tibetan	1(2)	0(0)	
Domicile	Rural	17(35)	24(50)	.0689 ( $\chi^2$ -test)
	Urban	13(27)	16(33)	
	Sub-urban	18(38)	8(17)	
Employment	Employed	42(88)	40(83)	.7724 ( $\chi^2$ -test)
	Unemployed	6(12)	8(17)	
Marital status	Married	26(54)	27(56)	.8374 ( $\chi^2$ -test)
	Unmarried	22(46)	21(44)	
Anemias		25(52)	31(65)	.3006 ( $\chi^2$ -test)
DASS-21 score				
Depression	Minimum	9	9	.2114 (Mann-Whitney test)
	Maximum	28	29	
	Median	18	16.5	
Anxiety		14 ± 4.2	15.46 ± 4.15	.106 (paired <i>t</i> test)
Stress	Minimum	12	12	.626 (Mann-Whitney test)
	Maximum	36	38	
	Median	22	22	

Variables are depicted as mean (range) or frequency (percentage) or mean ± standard deviation (SD).  
 DASS-21: Chinese short version of Depression Anxiety and Stress scale.  
 Results were considered significant if *P* < .05.



**Figure 2.** DASS-21 score for depression of females at different time levels. Baseline: Within 24 hours after admission to the hospital. Postintervention: Immediately before discharged. DASS-21 = Chinese short version of Depression Anxiety and Stress scale.

a major disadvantage. This may fail to completely comprehend and communicate the impact of CBT. Second, the number of participants was relatively small. However, due to a shortage of specialists and the virus's rapid dissemination, a considerable number of patients were unable to participate in the trial and get standard face-to-face CBT during the COVID-19 outbreak.

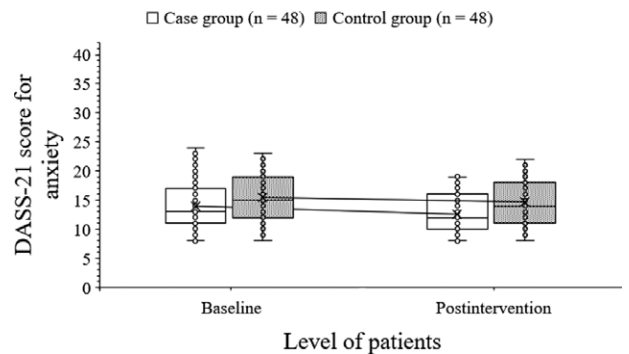
**6. Conclusions**

The current research looked at the betterment of CBT in improving mental health, such as depression, anxiety, and stress, in patients who had endometriosis surgery. Patients with endometriosis can benefit from CBT, according to our

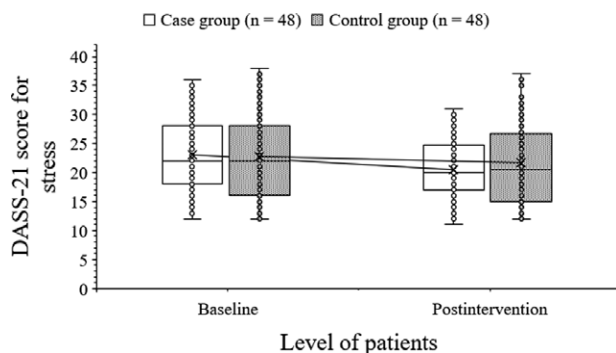
findings. However, the findings of these pilot studies suggest that cognitive behavioral therapies can help women with endometriosis cope with anxiety, depression, and stress and that more well-designed randomized control trials are needed in the future.

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**Figure 3.** DASS-21 score for anxiety of females at different time levels. Baseline: Within 24 hours after admission to the hospital. Postintervention: Immediately before discharged. DASS-21 = Chinese short version of Depression Anxiety and Stress scale.



**Figure 4.** DASS-21 score for the stress of females at different time levels. Baseline: Within 24 hours after admission to the hospital. Postintervention: Immediately before discharged. DASS-21 = Chinese short version of Depression Anxiety and Stress scale.

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**Writing – review & editing:** Wei Zheng.

**Table 3**

Chinese short version of Depression Anxiety and Stress scale for depression for different severity levels.

Severity level	Groups								
	Case group				Control group				
	Usual care + Cognitive behavioral therapy				Usual care				
Non-treatment intervention(s)	48				48				Comparisons between groups at EL
Numbers of females	BL	EL	**P value	BL	EL	**P value	P value		
Normal	1(2)	8(16)*	.0356	1(2)	2(4)	.5575	.0948		
Mild	10(21)	7(15)	.5928	14(29)	16(33)	.8257	.0558		
Moderate	19(40)	19(40)	.9999	22(46)	21(44)	.8374	.6799		
Severe	15(31)	14(29)	.8241	9(19)	9(19)	.9999	.3388		
Extremely severe	3(6)	0(0)	.2407	2(0)	0(0)	.4749	N/A		

BL = baseline (within 24 h after admission to the hospital), EL = postintervention, N/A = not applicable. Variables are depicted as frequency (percentage). The Chi-square test was used for statistical analysis. Results were considered significant if  $P < .05$ . \*Significantly higher than that of BL. \*\*Between BL and EL.

**Table 4**

Chinese short version of Depression Anxiety and Stress scale for anxiety for different severity levels.

Severity level	Groups								
	Case group				Control group				
	Usual care + Cognitive behavioral therapy				Usual care				
Non-treatment intervention(s)	48				48				Comparisons between groups at EL
Numbers of females	BL	EL	**P value	BL	EL	**P value	P value		
Normal	0(0)	0(0)	N/A	0(0)	0(0)	N/A	N/A		
Mild	6(13)	9(19)	.574	4(8)	4(8)	.9999	.2328		
Moderate	23(48)	24(50)	.8382	18(38)	21(43)	.6777	.6825		
Severe	13(26)	15(31)	.8223	16(33)	18(38)	.831	.6674		
Extremely severe	6(13)	0(0)*	.035	10(21)	5(11)	.2609	.0662		

BL = baseline (within 24 h after admission to the hospital), EL = postintervention, N/A = not applicable. Variables are depicted as frequency (percentage). The Chi-square test was used for statistical analysis. Results were considered significant if  $P < .05$ . \*Significantly fewer than that of BL. \*\*Between BL and EL.

**Table 5**  
**Chinese short version of Depression Anxiety and Stress scale for stress for different severity levels.**

Severity level	Groups						Comparisons between groups at EL
	Case group			Control group			
	Usual care + Cognitive behavioral therapy			Usual care			
Non-treatment intervention(s)							
Numbers of females	48			48			
Level of time	BL	EL	*P value	BL	EL	*P value	P value
Normal	3(6)	4(8)	.6947	7(15)	8(17)	.7786	.3545
Mild	10(21)	17(35)	.1732	10(21)	11(23)	.805	.2616
Moderate	18(38)	17(35)	.8321	14(29)	15(31)	.8241	.8286
Severe	14(29)	10(22)	.4795	12(25)	11(23)	.811	.805
Extremely severe	3(6)	0(0)	.2407	5(10)	3(6)	.7119	.2407

BL = baseline (within 24 h after admission to the hospital), EL = postintervention.

Variables are depicted as frequency (percentage).

The Chi-square test was used for statistical analysis.

Results were considered significant if  $P < .05$ .

\*Between BL and EL.

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