

ORIGINAL RESEARCH



The effect of cognitive behavioral stress management on the psychological status and pain stress response of parturients with cesarean section

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Abstract

Purpose: This study aimed to explore the effect of cognitive behavioral stress management on the psychological status and pain stress response of parturients with cesarean section. **Method:** A total of 100 parturients who received cesarean delivery in a hospital from April 2020 to April 2021 were recruited in this study and randomly divided into control group and study group. The control group received routine nursing care, while the study group received cognitive behavioral stress management for 12 weeks before delivery. The negative emotions, stress levels, hope levels and stress hormone levels in serum of the two groups were measured. **Results:** Before the intervention (T0), there was no significant difference between the two groups (all $p > 0.05$). Immediately after entering the operating room (T1) and at the end of the operation (T2), the scores of the Self-rating Anxiety Scale (SAS), the Self-rating Depression Scale (SDS) and Pregnancy Stress Scale (PSS) in study group were significantly lower than those in control group (all $p < 0.05$). The hope level scale (HHI), the scores of positive attitude to reality and future (T), positive actions taken (P), and maintaining close relationship with others (I) in study group were markedly higher in the study group compared control group (all $p < 0.05$). The levels of cortisol (Cor), adrenaline (ADR) and adrenocorticotropic hormone (ACTH) in serum were significantly lower in study group than those in control group (all $p < 0.05$). **Conclusion:** Cognitive behavioral stress management intervention for parturients with cesarean section before delivery can effectively reduce their negative emotions and stresses, improve their level of hope and relieve their pain-induced stress.

Keywords

Cesarean section; Cognitive behavioral stress management; Negative emotions; Stresses; Hope level; Pain stress response

1. Introduction

Cesarean section is an invasive method of obstetric delivery. The rate of cesarean section in China has always maintained at a high level. The occurrence rate of cesarean section in China had reached 40.6% in 2016 [1], and majority of cases were first-time parturition. Considering many factors including physiological, social and emotional changes, parenting and medical issues, surgical trauma and complications, postpartum recovery and others, the parturients often face severe stress burdens, leading to varying degrees of anxiety, depression and other symptoms during the perinatal period [2, 3], as well as negative emotions such as isolation, helplessness and fear in the late delivery process. In addition, the surgery-induced pain caused can induce the systemic stress response of parturients [4, 5]. Current studies have shown that pregnancy stress response is a potential risk factor for adverse perinatal outcomes, including premature delivery (gestational age <37

weeks), low birth weight, congenital heart disease, behavioral and mental health problems, *etc.* [6–8].

Cognitive behavioral stress management (CBSM) is one type of the cognitive behavioral therapy, that encourages patients to express the source of their stresses and vent their negative emotions under a conscious and comfortable state. Moreover, it can strengthen stress coping skills and relief strategies, including progressive muscle relaxation, abdominal breathing and meditation, and self-suggestion. The effectiveness of the cognitive behavioral stress management has been demonstrated in Acquired Immune Deficiency Syndrome (AIDS) patients [9, 10]. Notably, some researchers have found that a single relaxation technique can effectively improve the negative psychological mood of pregnant women at early stage [11]. Similarly, a recent report adopted companionship combined with music therapy and language induction in the context of video and music to conduct intervention to the parturients with cesarean section, further confirming that relaxation train-

ing can effectively reduce negative emotions such as anxiety and depression of the parturients.

This study aimed to explore the effect of cognitive behavioral stress management intervention combined with positive psychology on the psychological status and pain stress response of parturients with cesarean section. By comparing the differences of the negative emotions, stress levels, hope levels and serum stress hormone levels between the study group and the control group, we found that cognitive behavioral stress management intervention could help parturients with cesarean section before delivery effectively reduce negative emotions and stresses, improve the level of hope and relieve their pain-induced stress.

2. Materials and methods

2.1 General information

A total of 100 parturients who had undergone cesarean section delivery in Zhejiang Provincial People's Hospital were selected as the research objects, and they were divided into a control group and a study group with 50 cases in each group according to the random number table method. The average age in the control group was (31.52 ± 5.05) years old, and the average body weight before delivery was (69.02 ± 6.79) kg. The average age in the study group was (32.22 ± 5.41) years old, and the average body weight before delivery was (68.42 ± 6.24) kg. There was no statistically significant difference in age or body weight between the two groups of parturients (all $p > 0.05$), so the data of the two groups were comparable.

2.2 Inclusion and exclusion criteria

The inclusion criteria included: (1) primipara; (2) meet the indications for cesarean section; (3) normal cognitive function; (4) can accept spinal anesthesia; (5) the parturient herself or her family members signed the informed consent form. The exclusion criteria included: (1) combined with prenatal depression, anxiety or other mood disorders; (2) combined with schizophrenia or other mental disorders; (3) combined with pneumonia or other systemic infectious diseases; (4) combined with malignant tumor diseases.

2.3 Methods of intervention

The parturients in the control group received routine treatments and nursing care during the entire pregnancy. Twelve weeks before the expected delivery date, they received routine cesarean section related health education, improved examination, diet and posture guidance, and perioperative preparation and other clinical treatment. During the delivery, they received routine nursing care, including non-invasive connection methods to monitor blood pressure, heart rate, blood oxygen saturation and other vital signs, assistance to proper position during spinal anesthesia, and information of the delivery process in real time.

On the basis of the control group, cognitive behavioral stress management was carried out in the study group with group intervention as the main strategy and "one-on-one" as the supplement 12 weeks before the expected delivery date. Group

intervention is mainly based on group courses, with 5–8 people as a group, once a week, 120 min each time (90 min for stress management, and 30 min for relaxation training), which lasted for 10 weeks. The detailed contents were as following: (1) Psychologists were invited to give lectures on the physiological impacts of stresses, cognitive behavioral explanations of stresses and emotions, rational thinking replacement, coping skills training, self-confidence training, anger management, how to identify social support resources, *etc.* The researchers adopted empathy, encouragement, exemplification, questioning and other techniques to establish the basis of trust with patients, and utilized positive psychological strategies to create a friendly and supportive atmosphere. (2) Relaxation training: A variety of relaxation techniques were demonstrated by uniformly trained specialized nurses to develop progressive muscle relaxation, meditation, and self-suggestion training. ① Progressive relaxation training guidance: firstly, take a deep breath for 3 times to relax the whole body, and then contract and relax the muscle groups of the hands → arms → face → neck → shoulders → chest → back → abdomen → hips → legs → feet to achieve tension and relaxation of the whole body muscles, and each time the practice lasts for 30 min; ② Meditation and self-suggestion training guidance: The researchers provide soft and relaxing music, place the parturients in a quiet environment, and guide the parturients to take a relaxed and natural body posture and close the eyes to gradually relax their mood. And then the parturients are guided to imagine pleasant scenes and situations that can clarify their values or attitudes, and each time the practice lasts for 30 min. (3) Expressive support training: the researchers provide a group form of social support environment to the parturients, so that they can express their stresses and bad emotions, support each other and reduce loneliness, obtain more family and social supports, and change their self-appearance and self-awareness. In that way, they would have normalized experience, improved emotional expression, and their fear and incorrect understanding of the future can be resolved. The individual intervention adopts the form of "one-on-one". The researcher evaluates and identifies the existing psychological problems of the parturients, guides them to talk and vent, promptly relieves their negative emotions, and further guides and strengthens the behavioral intervention, relaxation skills and other psychological knowledge from the group intervention courses, urge them to practice meditation as required to achieve behavior changes, and provide individualized guidance at any time.

2.4 Observation indicators

Before the implementation of the intervention (T0), immediately after entering the operating room (T1), and at the end of the operation (T2), the Self-rating Anxiety Scale (SAS) and the Self-rating Depression Scale (SDS) were used to assess the negative motion level of the parturients. SAS and SDS were compiled by Zung. Both scales contain 20 statement items, which are scored according to Likert 4-level scoring (no or rarely met, occasionally met, often met, always/almost always met) and multiplied by 1.25 to get the final standard score. The higher score indicates the more severe negative emotions.

The Pregnancy Stress Scale (PSS) was used to evaluate the stress levels of the two groups. The scale was compiled by Chen *et al.* [12], which contains 30 items and is divided into 4 dimensions, which include: Dimension 1: The pressure caused by recognizing their roles as parents; Dimension 2: The pressure caused by ensuring the health and safety of the mother and the child; Dimension 3: The pressure caused by body shape and physical activity changes; Dimension 4: Other factors. By adopting Likert 4-level scoring method, each item is counted separately: 0–3 points, and the cumulative score of each item is the total score. The higher the total score, the greater the stress experienced by the parturients during pregnancy. The Herth Hope Index (HHI) was used to assess the patient's level of hope, including 12 items and 3 dimensions, namely, positive attitudes towards reality and future (T), positive actions taken (P), and maintaining close relationships with others (I). Using Likert 4-level scoring method, the total score is 12 to 48 points, of which 12 to 23 points are regarded as low level, 24 to 35 points are regarded as medium level, and 36 to 48 points are regarded as high level. At the same time point, cubital venous blood samples were obtained from the two groups of parturients. After anticoagulation treatment, radioimmunoassay was used to detect the content of stress hormones including cortisol (Cor), adrenaline (ADR) and adrenocorticotrophic hormone (ACTH).

2.5 Statistical analysis

The data were analyzed by SPSS25.0 software (International Business Machines Corporation, IBM, Armonk, NY, USA), and the measurement data of normal distribution are expressed as mean \pm standard deviation groups ($\bar{x} \pm s$), and the comparison between groups was analyzed by *t* test. The measurement data of non-normal distribution is expressed by the median and interquartile range M (P25, P75), and the rank sum test was used for comparison between groups. The test level is $\alpha = 0.05$, and the statistically significant difference is indicated by $p < 0.05$.

3. Results

3.1 Negative emotions score

As shown in Table 1, at T0, there was no significant difference in SAS and SDS scores between the two groups of parturients (all $p > 0.05$). At T1 and T2, the SAS and SDS scores of the study group were significantly lower than those of the control group (all $p < 0.05$).

3.2 Stress level score

As shown in Table 2, at T0, there was no statistically significant difference between the two groups in PSS scores in all dimensions (all $p > 0.05$). At T1 and T2, the scores of the four dimensions of PSS in the study group were markedly lower than those in the control group (all $p < 0.05$).

3.3 Hope level score

As shown in Table 3, at T0, there was no statistically significant difference in HHI scores between the two groups of parturients

(all $p > 0.05$). At T1 and T2, the scores of the three dimensions of T, P and I in the HHI of the study group were profoundly higher than those of the control group (all $p < 0.05$).

3.4 Stress hormones content

As shown in Table 4, at T0, there was no significant difference in the levels of stress hormones in serum of the two groups of parturients (all $p > 0.05$). At T1 and T2, the levels of Cor, ADR and ACTH in serum of the parturients in the study group were significantly lower than those of the control group (all $p < 0.05$).

4. Discussion

At present, the rate of cesarean section in China is gradually increasing. Childbirth is a major important experience in a person's life. The psychophysiology and social adaptation of the parturient at the perinatal stage are unstable. This study found that the implementation of cognitive behavioral stress management with group intervention as the main and "one-on-one" as the supplement 12 weeks before the expected date of delivery can significantly alleviate the anxiety and depression of the parturients in the study group at the beginning and the end of the operation. The SAS and SDS scores were significantly lower in the study group. Health education or conversation helped the parturients to obtain targeted information, improve bad cognition, and eliminate their negative emotions. At the same time mobilizing the social support system, and carrying out the progressive whole body relaxation training and other behavioral intervention methods to actively cope with various stress responses significantly improved their level of hope and relieve their pain-induced stress.

Studies in other countries have found that the stress level of the parturients at the later stage of pregnancy is significantly higher than that at the early stage [13, 14]. Cognitive behavioral stress management can effectively prevent and control stress levels [15], and its critical elements include cognitive structure adjustment, improvement of stress awareness, relaxation training, problem-solving training, self-management and sufficient social support. Li *et al.* [16] used cognitive behavioral stress management based on cognitive intervention, relaxation skills training, problem-solving training and social supports on pregnant women by conducting intervention for 7 times during the whole pregnancy, which can effectively reduce the stress level of parturients. This study found that effective cognitive behavioral stress management can relieve parturients' stress during pregnancy, especially the stresses caused by changes in parental roles, health and safety of mother and child, and appearance. Through face-to-face communication, nursing professionals can assess and understand the sources of the parturients' stresses, and provide them with further interventions accordingly [17]. In addition, consistent with previous studies [18], this study provides guidance for the parturients on relaxation skills, such as breath and muscle relaxation, and utilization of relaxing imagery, which can effectively relieve stresses.

Hope, as a dynamic inner energy, can guide the parturient to smoothly go through the delivery process and happily

TABLE 1. Comparison of negative emotion scores between the two groups ($\bar{x} \pm s$).

Group	Number	SAS			SDS		
		T0	T1	T2	T0	T1	T2
Control group	50	58.56 ± 5.54	58.18 ± 5.18	51.76 ± 6.47	56.08 ± 7.01	55.22 ± 5.69	47.86 ± 6.78
Study group	50	60.02 ± 7.72	52.00 ± 5.89	42.10 ± 4.93	58.32 ± 5.27	52.64 ± 6.04	41.08 ± 4.60
<i>t</i> value		-1.086	5.582	8.398	-1.806	2.198	5.853
<i>p</i> value		0.28	0	0	0.074	0.03	0

The *p* value less than 0.05 was considered statistical significance. SAS: Self-rating Anxiety Scale; SDS: the Self-rating Depression Scale; T0: the time before the intervention; T1: the time immediately after entering the operating room; T2: the time at the end of the operation.

TABLE 2. Comparison of the stress level scores of the two groups (M (P25, P75)).

Group	Number	Parent role			Health and safety of mother and child		
		T0	T1	T2	T0	T1	T2
Control group	50	32(29, 35)	15(14, 18)	24(22, 28)	18(16, 21)	15(14, 18)	15(13, 18)
Study group	50	30(26, 34)	14(12, 15)	21(18, 23)	18(16, 21)	15(13, 17)	14(11, 15)
<i>Z</i> value		-1.157	-4.828	-4.022	-0.402	-3.354	-3.786
<i>p</i> value		0.247	0	0	0.688	0.001	0
Group	Number	Changes in body shape and activity			Other factors		
		T0	T1	T2	T0	T1	T2
Control group	50	9(7, 10)	7(6, 9)	6(5, 7)	6(6, 7)	5(4, 6)	4(3, 5)
Study group	50	9(7, 10)	6(5, 7)	4(3, 6)	7(5, 7)	4(3, 6)	3(2, 4)
<i>Z</i> value		-0.949	-2.82	-4.758	-0.468	-2.51	-3.408
<i>p</i> value		0.342	0.005	0	0.64	0.012	0.001

The *p* value less than 0.05 was considered statistical significance. T0: the time before the intervention; T1: the time immediately after entering the operating room; T2: the time at the end of the operation.

TABLE 3. Comparison of the hope level scores of the two groups (M (P25, P75)).

Group	Number	T			P			I		
		T0	T1	T2	T0	T1	T2	T0	T1	T2
Control group	50	11(9, 12)	12(10, 13)	13(12, 15)	10(9, 12)	11(10, 12)	12(11, 13)	11(9, 11)	11(9, 12)	12(10, 13)
Study group	50	11(10, 12)	13(12, 15)	15(13, 16)	10(9, 11)	13(11, 13)	15(14, 16)	11(9, 12)	12(11, 14)	14(12, 15)
<i>Z</i> value		-0.811	-2.381	-4.074	-0.893	-4.151	-6.734	-0.737	-4.471	-5.357
<i>p</i> value		0.417	0.017	0	0.372	0	0	0.461	0	0

The *p* value less than 0.05 was considered statistical significance. T: positive attitudes towards reality and future, P: positive actions taken, I: maintaining close relationships with others; T0: the time before the intervention; T1: the time immediately after entering the operating room; T2: the time at the end of the operation.

accept the new life thereafter [19]. Some parturients lack the knowledge about parturition and the whole process of childbirth, so they always have fear about delivery [20, 21]. Moreover, they often suffer from gains and losses after childbirth, worry about physical recovery and baby care, and cannot face their future life with positive attitudes, which easily cause depression. Studies have shown [22] that the level of hope is negatively correlated with the severity of negative emotions from cesarean section, and a high level of hope is one of the important reasons for the good outcome of cesarean section. This study found that cognitive behavioral stress management

can effectively improve the level of hope of the parturients with cesarean section during delivery, which is also an inevitable result and an important reason for the relief of their negative emotions. The results suggest that the nursing staff should provide timely spiritual support to the primipara, resolve their negative emotions, rebuild their hope and belief, and guide them to formulate appropriate short-term, medium-term, and long-term goals to maintain a positive and optimistic attitude, to improve their level of hope, and to secure the mental health of the parturients.

Due to the trauma of cesarean section, such as skin incision,

TABLE 4. Comparison of stress hormones content of the two groups ($\bar{x} \pm s$).

Group	Number	Cor (nmol/L)			ADR (pg/mL)			ACTH (pg/mL)		
		T0	T1	T2	T0	T1	T2	T0	T1	T2
Control group	50	581.78 ± 62.89	735.46 ± 85.30	622.5 ± 68.33	71.3 ± 8.39	93.8 ± 7.92	80.42 ± 7.77	30.7 ± 3.45	47.56 ± 5.44	40.64 ± 4.31
Study group	50	601.72 ± 53.53	630.56 ± 57.96	557.08 ± 74.79	68.32 ± 8.90	81.68 ± 9.12	65.14 ± 8.11	30.52 ± 3.81	40.38 ± 4.67	34.02 ± 4.61
<i>t</i> value		-1.707	7.193	4.566	1.723	7.096	9.616	0.247	7.079	7.419
<i>p</i> value		0.091	0	0	0.088	0	0	0.805	0	0

The *p* value less than 0.05 was considered statistical significance. Cor: cortisol; ADR: adrenaline; ACTH: adrenocorticotropic hormone; T0: the time before the intervention; T1: the time immediately after entering the operating room; T2: the time at the end of the operation.

delivery of the fetus, and compression to stop bleeding, the parturients will feel obvious pain [23, 24]. Severe pain can directly lead to systemic stress response of the parturient. Because of that, large amounts of stress hormones, such as Cor, ADR, and ACTH are synthesized and secreted, leading to the increased heart rate and blood pressure of the parturient. All those phenomena are not conducive to intraoperative hemostasis and increases the incidence of postoperative hemorrhage [25]. This study found that cognitive behavioral stress management can reduce the parturient’s serum levels of stress hormones like Cor, ADR and ACTH at T1 and T2, confirming that it can effectively reduce the severity of systemic stress during the delivery process. The effects of the intervention may be due to that stress cognition, relaxation training, and expressive support will have certain impacts on the sympathetic nerves of the parturients, thereby alleviating the body’s stress response to the operation. On the other hand, cognitive behavioral stress management can stimulate the parturient and cause their central nervous system to release neurotransmitters to improve the level of enkephalin in their bodies, thereby achieving the effect of pain relief. Moreover, imagery training will also help the parturients to ignore pain stimuli to a certain extent. Taken together, these results suggest that cognitive behavioral stress management can be used as one of the effective interventions to relieve parturients’ pain in clinical practice. Nevertheless, our investigation still has some limitations. Given the limitation of patients and short duration of treatment, our conclusion should be paid more efforts in the future, through expanding the number of patients and prolonging the treatment duration.

5. Conclusion

In conclusion, behavioral stress management intervention for parturients with cesarean section can effectively reduce their anxiety, cognitive depression and other negative emotions, relieve their stresses, improve their level of hope, and reduce pain-induced stress response during the delivery process.

AUTHOR CONTRIBUTIONS

XQY and JJC—designed the study and wrote the draft of the manuscript; FJY and BT—collected the data and analyzed the data; XMC and QZ—supervised the data collection and

reviewed the draft of the manuscript. All authors have read and approved the manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study was approved by the Medical Ethics Committee of Zhejiang Provincial People’s Hospital (Approval No. 2022-112) and the parturients were given informed consent.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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