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ORIGINAL RESEARCH

Analysis of Risk Factors for Negative Emotions in the Perioperative Period in Patients with Benign Ovarian Cysts Treated Laparoscopically and Their Impact on Prognosis: A Retrospective Cohort Study

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Background: Ovarian cysts are common diseases among women. They might affect reproductive function in severe cases, and thus, patients with ovarian cysts often have negative emotions.

Purpose: In this study, we elucidated the risk factors for negative emotions in patients with ovarian cysts during the perioperative period and their impact on prognosis.

Methods: From August 2019 to August 2021, we retrospectively included 330 female patients with pathologically diagnosed benign ovarian cysts as potential participants in this study. Based on the established inclusion and exclusion criteria, 308 patients were finally included. We performed the *t*-test and Chi-squared test to analyze the relationship between the negative emotions of the patients and prognosis. Binary logistic regression and linear regression were used to assess independent risk factors for negative patient mood and prognosis.Based on SAS and SDS scores, patients with anxiety and/or depression are considered to combined negative emotions.

Results: In total, 47 patients (15.3%) had negative emotions during the perioperative period. The results of the binary logistic regression analysis showed that the menstrual status (OR = 3.099, P = 0.028), intraoperative blood loss (OR = 1.043, P = 0.029), recurrence (OR = 3.691, P = 0.047), and several other factors were independent risk factors for negative emotions. The results of the linear regression analysis showed that the presence of combined negative affect (P = 0.000), recurrence (P = 0.010), postoperative IL-2 (P = 0.035), and several other factors were independent risk factors for patient prognosis.

Conclusion: In clinical work, identifying the independent risk factors for negative emotions and enhancing their behavioral awareness and self-efficacy is necessary to improve their quality of life after surgery. Meanwhile, we will continue our exploration of the causes of negative emotions in patients in the future.

Keywords: benign ovarian cyst, negative emotions, prognosis, anxiety, depression

Introduction

Ovarian cysts are common gynecological diseases, accounting for about 10–20% of adnexal masses.[1] The mechanism of the pathogenesis of ovarian cysts remains unknown. Researchers argue that it is related to genetic, endocrine, and environmental factors. It mostly presents clinically as an active, non-tender, and medium-sized intra-abdominal mass.[2] It has a prevalence of approximately 7.3% in children and adolescents,[3] 5–15% in women of childbearing age,[4] and 2.5–18% in postmenopausal women.[5] Most ovarian cysts in all age groups are simple cysts; mixed cystic lesions and completely solid ovarian lesions have a higher malignancy rate than simple cysts.[6] Although ovarian cysts are mostly benign, age is the most important independent risk factor, and postmenopausal women have a higher risk of malignancy for any type of cyst.[6] Most adnexal masses in women

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of childbearing age are benign, with malignancies found in only 7–13% of premenopausal patients and 8–45% of postmenopausal patients.[7] Most benign ovarian cysts are often asymptomatic, and 70–80% of follicular cysts resolve on their own; thus, their overall prognosis is good.[8] However, if ovarian functions are affected in women of childbearing age, menstrual changes might occur and even affect reproductive function. Patients with ovarian cysts might also experience serious changes in ovarian morphology and function if they do not undergo quick treatment.[9] For example, ovarian cysts can lead to acute abdominal conditions, such as pelvic pain, cyst rupture, blood loss, and ovarian torsion. Thus, patients with ovarian cysts often suffer from an immense psychological burden.[10]

Since ovarian cysts greatly affect the daily life of some patients, choosing the appropriate surgical procedure is important. The surgical treatment of ovarian cysts depends on many clinical factors, such as the type and size of the cyst.[11] Asymptomatic patients can be monitored conservatively by performing serial transvaginal ultrasound examinations, as most cysts resolve without intervention. If the cysts do not resolve after several menstrual cycles, surgical debridement might be required.[12] Surgical approaches include open surgery and laparoscopic surgery. For benign cases, the laparoscopic approach is preferred.[13] Laparoscopic management is better for the patient than open surgery and is quite safe for both cystectomy and oophorectomy.[14] Due to the advancements in laparoscopic techniques every year, these techniques have shown significant advantages, such as lower postoperative trauma, smaller wounds, lesser blood loss, faster recovery, better appearance, lesser postoperative pain, and lesser adhesions.[15] Therefore, laparoscopic techniques are better than traditional open surgery for treating ovarian cysts.[16] However, laparoscopic treatment of large ovarian tumors has certain limitations, including long operative time and blood loss due to restricted pelvic space; during such complications, conversion to open surgery might be selected.[17] In the Japanese Society for Endoscopic Surgery and the Ghezzi trial, perioperative complications were reported to be 1.3% and 1.6%, respectively.[18,19] In the postoperative period, patients are often prone to greater psychological barriers and negative emotions because of their inadequate medical knowledge, lesser understanding, and insufficient cognition of ovarian cysts and surgical procedures. According to the literature,[20] women in the perioperative period are prone to anxiety and depression. For example, one study of ovarian cancer survivors found that their mood was consistently lower.[21] However, studies on the prognosis of patients with perioperative ovarian cysts due to the development of negative emotions are limited. In this study, we investigated whether the clinical characteristics and postoperative complications of different patients affect the development of negative emotions and the role of negative emotions on the prognosis of the patients. We also elucidated the independent risk factors for negative emotions and prognosis to identify the high-risk groups at the earliest and make an informed decision to improve the prognosis of patients and improve their postoperative quality of life.

Materials and Methods

Research Participants

In total, 308 patients with ovarian cysts admitted to Wuxi Maternal and Child Health Hospital from August 2019 to August 2021 were included in this study with a retrospective analysis.

The inclusion criteria were as follows: (I) patients with significant pain and pressure in the pelvic area, significant pain during sexual intercourse, movable masses, and ovarian cysts diagnosed by laparoscopy, CT, magnetic resonance, and pathology; (II) patients with ovarian cysts diagnosed as substantial, eligible for surgical indications, and requiring surgical removal of the lesion; (III) cysts under 10 cm in maximum diameter; (IV) patients without other endocrine and immune system diseases; (V) patients without other gynecological diseases and malignant tumors.

The exclusion criteria were as follows: (I) Patients with no surgical indication and whose cysts subsided after conservative treatment or drug treatment after several months of recuperation; (II) patients who had a history of nervous system diseases or mental illness, and those whose family members could not cooperate with relevant nursing measures; (III) patients with severe cardiovascular and cerebrovascular diseases, other malignant tumors, pelvic floor dysfunction, and coagulation dysfunction; (IV) patients with poor body tolerance and whose health condition was not up to surgical standards; (V) patients with poor treatment compliance and repeated non-compliance with medical advice during the perioperative period; (VI) patients who were administered hormone drugs for treatment within three months before surgery; (VII) patients who were pregnant or breastfeeding (see Figure 1 for details).

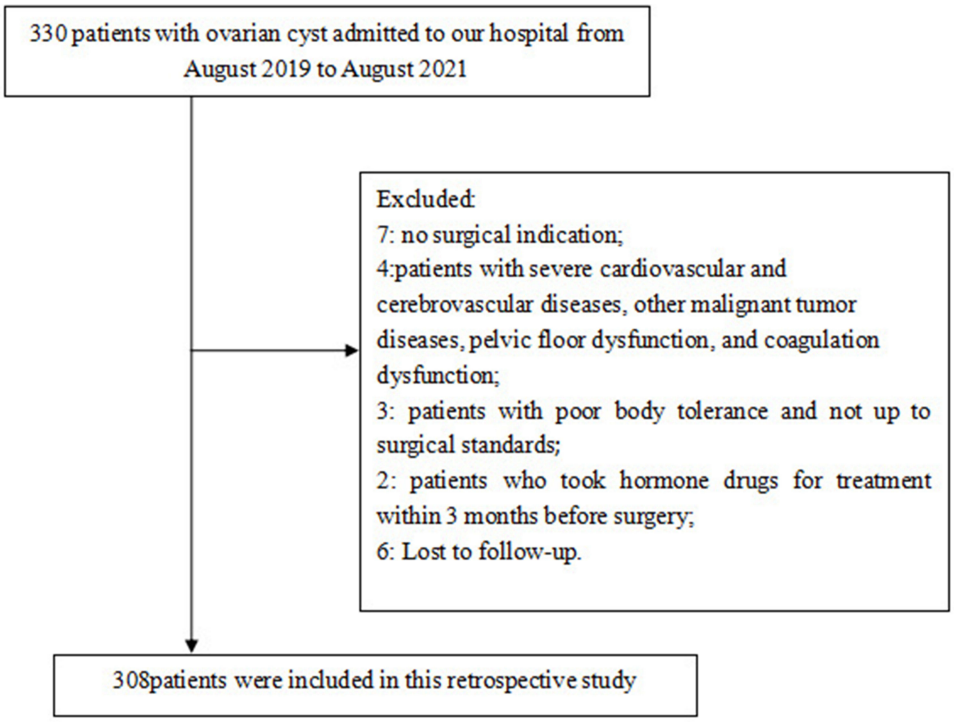

Figure 1 Flow chart of patient selection.

The purpose of this study was to investigate the relationship between risk factors of negative emotions and prognosis in patients with benign ovarian cysts treated by laparoscopy during perioperative period. According to our previous studies and related literature reports, the perioperative prevalence of negative emotions in patients with benign ovarian cysts treated by laparoscopy is about 15%. The allowable error is 3%, the confidence is 1-α=0.95, and the sample size N=215 cases to be investigated is calculated using PASS 15 software. Assuming that the non-response rate of the subjects is 10%, the sample size N=215÷0.9=239 cases is required. Assuming that the qualified rate of the questionnaire is 90%, the total sample size is N =239÷0.9=266 cases. Besides, the general rule of binary logistic regression requires that the ratio of the number of items to the sample size be 1:5 to 1:10. Based on this, the sample size of this study was 330 cases. In total, 22 cases were either excluded or lost to follow-up, and the final number of participants was 308.

General Information Questionnaire

The general information questionnaire included demographic data (such as gender, age, BMI (body mass index), residence, monthly income, education level, with or without children, with or without a spouse) and clinical data (including with or without hypertension, with or without hyperlipidemia, with or without diabetes, age of menarche, maximum cyst diameter, cyst location, pathological type, degree of pelvic adhesion, disease course, menstrual status). Fully communicated with all enrolled patients and their families on the day of admission, and signed informed consent forms. After this, a statistical survey was conducted on the general condition of the patients. For clinical data, statistical results were improved after relevant examinations.

Negative Emotion Assessment

The Self-Rating Anxiety Scale (SAS) was used to determine the presence and degree of anxiety. It consisted of 20 items, each rated from 1 to 4. The scores of each item were summed to obtain a crude score, which was multiplied by 1.25 to give a standard score. The evaluation criteria were as follows: SAS score > 50; 50–59 indicated mild anxiety, 60–69 indicated moderate anxiety and 70 and above indicated severe anxiety. The scale had good reliability and validity, and its Cronbach's α coefficients were above 0.75.

The Self-Rating Depression Scale (SDS) was used to determine the presence and degree of depression. It consisted of 20 items; an SDS score > 52 was used as the evaluation criterion. A score of 53 or above was classified as depression; 53–62 indicated mild depression, 63–72 indicated moderate depression, and greater than 72 indicated severe depression. The SDS had good reliability and validity, and its Cronbach's α coefficients were above 0.75. Based on SAS and SDS scores, patients with anxiety and/or depression are considered to combined negative emotions.

Post-Operative Recurrence

The recurrence of ovarian cysts was assessed by the presence of cystic structures in the ovary on more than two postoperative ultrasound examinations. The cysts were found to be filled with fluid.

The last follow-up was conducted in August 2022.

Ovarian Function Assessment

Serum estradiol (E2), follicle-stimulating hormone (FSH), luteinizing hormone (LH), and anti-mullerian hormone (AMH) levels were measured on days 2–3 of the menstrual cycle before surgery and one month after surgery to assess the reserve function of the ovaries.

Prognostic Assessment Using PQRS

The postoperative quality recovery scale (PQRS)[22] was used to assess the recovery of patients in both groups during discharge. The scale included six dimensions, including the physiological domain (with 27 points on a scale of 1 to 3), nociceptive domain (with 10 points on a scale of 1 to 5), emotive domain (with 10 points on a scale of 1 to 5), activities of the daily living domain (with 12 points on a scale of 1 to 3), cognitive domain (with 25 points on a scale of 1 to 5), and overall evaluation domain (with 16 points on a scale of 1 to 4). A higher score indicated better physical recovery of the patients.

The last follow-up was conducted in September 2021.

Statistical Analysis

The results of each scale were entered into a computer for score conversion, and statistical analysis was performed using SPSS 26 (IBM SPSS, USA), with measurement data expressed as the mean and standard deviation and count data expressed as frequencies and percentages. The data are presented as the mean ±SD. Statistical analysis between the groups with and without negative emotions was performed using the *t*-test and Chi-squared test. Binary logistic regression was used to assess independent risk factors for negative patient mood, and linear regression was used to assess independent risk factors for patient prognosis. In logistic regression analysis, patients with negative emotions were assigned a value of "1" and those without negative emotions were assigned a value of "0". All differences between groups were considered to be statistically significant at $P < 0.05$ (two-sided).

Results

Baseline Data

The baseline data are shown in Table 1. In total, 308 patients with ovarian cysts were included in this study. There were 47 patients (15.3%) with negative emotions. Patients below 40 years old (n = 225; 73.1%) had a mean SDS score of 46.90 ±6.86. Patients who were 40 years old or older (n = 83; 26.9%) had a mean SDS score of 45.13 ±5.58. There were significant differences in the SAS and SDS scores of patients with or without children and with or without spouses, and also for the family monthly income, cyst site, and menstrual status ($P < 0.05$). Patients with children (n = 260; 84.4%) had an average SAS score of 43.37 ±5.70 and an average SDS score of 46.02 ±6.30. Patients without children (n = 48; 15.6%) had an average SAS score of 47.13 ±8.15 and an average SDS score of 48.58 ±7.65. Patients with spouses (n = 250; 81.2%) had an average SAS score of 43.61 ±5.87 and an average SDS score of 45.85 ±6.26. Patients without a spouse (n = 58; 18.8%) had an average SAS score of 45.43 ±7.68 and an average SDS score of 48.90 ±7.38. Patients with a monthly family income of less than 5000 yuan (n = 81; 26.3%) had an average SAS score of 46.27 ±6.98 and an average SDS score of 48.06 ±6.95. Patients with a monthly family

Table 1 SAS and SDS Scores in Patients with Benign Ovarian Cysts

Item	N(%)	SAS (Mean±SD)	t	P	SDS (Mean±SD)	t	P
Age(year)							
<40	225(73.1)	44.18±6.63	−1.027	0.305	46.90±6.86	−2.100	0.037
≥40	83(26.9)	43.35±5.21			45.13±5.58		
BMI (kg/m^2)							
<24	176(57.1)	44.43±6.52	1.544	0.124	46.56±6.37	0.432	0.666
≥24	132(42.9)	43.32±5.90			46.23±6.88		
Fertility or not							
Have children	260(84.4)	43.37±5.70	3.059	0.003	46.02±6.30	2.497	0.013
No children	48(15.6)	47.13±8.15			48.58±7.65		
Spouse or not							
Have spouse	250(81.2)	43.61±5.87	1.998	0.047	45.85±6.26	3.227	0.001
No spouse	58(18.8)	45.43±7.68			48.90±7.38		
Address							
Countryside	75(24.4)	43.57±5.81	−0.604	0.546	46.60±7.44	0.269	0.788
City	233(75.6)	44.08±6.43			46.36±6.30		
Education level							
High School and below	122(39.6)	44.11±6.25	0.362	0.717	46.70±6.99	0.593	0.554
High School or above	186(60.4)	43.85±6.31			46.24±6.31		
Monthly household income (yuan)							
<5000	81(26.3)	46.27±6.98	3.960	0.000	48.06±6.95	2.637	0.009
≥5000	227(73.7)	43.13±5.80			45.84±6.36		
Basic diseases							
Yes	69(22.4)	45.19±5.90	−1.861	0.064	47.96±5.95	−2.212	0.028
No	239(77.6)	43.60±6.35			45.98±6.70		
Age of menarche							
<13	133(43.2)	43.76±6.22	−0.475	0.635	47.08±6.74	1.522	0.129
≥13	175(56.8)	44.10±6.34			45.93±6.43		
Maximum diameter of cyst							
<5 cm	250(81.2)	43.57±6.04	−2.234	0.026	46.16±6.09	−1.216	0.228
≥5 cm	58(18.8)	45.60±7.03			47.57±8.35		
Cyst site							
Unilateral	217(70.5)	43.45±6.08	−2.184	0.030	45.89±6.87	−2.188	0.029
Bilateral	91(29.5)	45.15±6.60			47.68±5.69		
Pelvic adhesions							
Yes	87(28.2)	44.83±7.11	−1.535	0.126	48.00±7.57	−2.666	0.008
No	221(71.8)	43.61±5.90			45.80±6.05		
Course of disease (year)							
<2	129(41.9)	43.27±6.17	−1.626	0.105	46.25±6.99	−0.393	0.694
≥2	179(58.1)	44.45±6.33			46.55±6.29		
Menstrual status							
Regular	105(34.1)	42.99±5.30	−2.094	0.037	45.02±5.90	−2.719	0.007
Irregular	203(65.9)	44.45±6.69			47.15±6.81		

Abbreviations: BMI, Body mass index; SAS, Self-Rating Anxiety Scale; SDS, Self-Rating Depression Scale.

income of 5000 yuan or more (n = 227; 73.7%) had an average SAS score of 43.13 ±5.80 and an average SDS score of 45.84 ±6.36. Patients with unilateral cysts (n = 217; 70.5%) had an average SAS score of 43.45 ±6.08 and an average SDS score of 45.89 ±6.87. Patients with bilateral cysts (n = 91; 29.5%) had an average SAS score of 45.15 ±6.60 and an average SDS score of 47.68 ±5.69. Patients with regular menstruation (n = 105; 34.1%) had an average SAS score of 42.99 ±5.30 and an average SDS score of 45.02 ±5.90. Patients with irregular menstruation (n = 203; 65.9%) had an average SAS score of 44.45 ±6.69 and an average SDS score of 47.15 ±6.81. The SDS scores of underlying diseases and abdominal adhesion were significantly different in ($P < 0.05$). Patients with underlying diseases (n = 69; 22.4%) had a mean SDS score of 47.96 ±5.95. Patients

without underlying diseases (n = 239; 77.6%) had an average SDS score of 45.98 ±6.70. Patients with abdominal adhesion (n = 87; 28.2%) had a mean SDS score of 48.00 ±7.57. Patients without abdominal adhesion (n = 221; 71.8%) had an SDS score of 45.80 ±6.05. The maximum diameter of the cyst with the SAS score differed significantly (P < 0.05). Patients with a maximum cyst diameter of < 5 cm (n = 250; 81.2%) had a mean SAS score of 43.57 ±6.04. Patients with a maximum cyst diameter of ≥5 cm (n = 58; 18.8%) had a mean SAS score of 45.60 ±7.03.

Perioperative Indicators in Patients with or Without Negative Emotions

The results of the *t*-test showed that intraoperative bleeding, time to recovery of postoperative gastrointestinal function, and the length of hospital stay were significantly different between the presence and absence of combined negative emotions (P < 0.05). In patients with combined negative emotions, the mean intraoperative bleeding was 71.04 ±11.56 mL, the mean postoperative gastrointestinal recovery time was 1.70 ±0.72 d, and the mean hospital stay was 9.72 ±2.38 d. In patients without combined negative emotions, the mean intraoperative bleeding was 66.64 ±8.78 mL, the mean postoperative gastrointestinal recovery time was 1.44 ±0.62 d, and the mean hospital stay was 9.72 ±2.38 d (Table 2).

Inflammatory Indicators in Patients with or Without Negative Emotions

The results of the *t*-test showed that the levels of four inflammatory factors, including CRP, IL-2, IL-6, and PCT, were not significantly different between whether or not combined with negative emotions before surgery (P > 0.05). In the postoperative period, the levels of CRP, IL-2, and PCT in the group with combined negative emotions were significantly higher than those in the group without negative emotions (P < 0.05). The levels of CRP, IL-2, and PCT in the group with negative emotions were 16.96 ±3.48 mg/L, 4.30 ±0.60 μg/mL, and 4.87 ±0.81 μg/L, respectively. The levels of CRP, IL-2, and PCT in the group without negative emotions were 14.98 ±3.23 mg/L, 4.09 ±0.46 μg/mL, and 4.61 ±0.80 μg/L. However, the difference in IL-6 levels between the groups was not statistically significant (P > 0.05) (Table 3).

Table 2 Perioperative Indicators in Patients with or Without Negative Emotions

Item (Mean±SD)	Intraoperative Bleeding Loss (mL)	Surgery Time (min)	Gastrointestinal Function Recovery Time (d)	Hospitalization Time (d)
With negative emotions	71.04±11.56	103.74±10.99	1.70±0.72	9.72±2.38
Without negative emotions	66.64±8.78	102.98±12.09	1.44±0.62	9.02±2.08
t	−3.005	−0.402	−2.5528	−2.078
P	0.003	0.688	0.011	0.039

Table 3 Inflammatory Indicators in Patients with or Without Negative Emotions

Item (Mean±SD)	PreoperativeCRP (mg/L)	PreoperativeIL-2 (ug/mL)	PreoperativeIL-6 (ng/L)	PreoperativePCT (ug/L)
With negative emotions	8.68±2.09	2.52±0.69	20.86±2.62	3.28±0.51
Without negative emotions	8.48±2.27	2.54±0.67	20.69±2.31	3.27±0.53
t	−0.554	0.196	−0.467	−0.158
P	0.580	0.845	0.641	0.875
With negative emotions	16.96±3.48	4.30±0.60	24.83±2.84	4.87±0.81
Without negative emotions	14.98±3.23	4.09±0.46	24.37±2.73	4.61±0.80
t	−3.831	−2.805	−1.054	−2.017
P	0.000	0.005	0.293	0.048

Abbreviations: CRP, C-reactive protein; IL-2, Interleukin 2; IL-6, Interleukin 6; PCT, Procalcitonin.

Ovarian Reserve Function Indicators in Patients with or Without Negative Emotions

The results of the *t*-test showed that the differences in the levels of the four indicators of FSH, LH, E2, and AMH before surgery between whether or not they were combined with negative emotions were not significant ($P > 0.05$). In the postoperative period, the levels of these four indicators were significantly higher in the group with negative emotions than in the group without negative emotions ($P < 0.05$). The levels of FSH, LH, E2, and AMH in the group with negative emotions were 11.26 ±1.24 mIU/mL, 10.86 ±1.89 mIU/mL, 175.20 ±17.02 pmol/L, and 3.79 ±0.68 ng/mL, respectively, whereas, the levels of FSH, LH, E2, and AMH in the group without negative emotions were 10.86 ±1.16 mIU/mL, 9.39 ±2.12 mIU/mL, 169.26 ±18.7 pmol/L, and 3.51 ±0.53 ng/mL, respectively, in the group without negative emotions (Table 4).

Complications in Patients with or Without Negative Emotions

The results of the Chi-squared test showed that the differences between the combination of postoperative fever, abdominal pain, infection, and recurrence with or without the combination of negative emotions were significant ($P < 0.05$). Among the patients with combined negative emotions, five patients (10.6%) had a postoperative fever, four patients (8.5%) had postoperative abdominal pain, three patients (6.4%) had a postoperative infection, and six patients (12.8%) had postoperative recurrence one year after surgery. In contrast, among the patients who did not present negative emotions, eight patients (3.1%) had a postoperative combined fever, five patients (1.9%) had postoperative combined abdominal pain, three patients (1.1%) had a postoperative combined infection, and 11 patients (4.2%) had postoperative recurrence one year after surgery (Table 5).

Binary Logistic Regression Analysis of the Negative Emotions of Patients

The results of the binary logistic regression analysis showed that the presence of children, monthly household income, the maximum cyst diameter, abdominal adhesions, menstrual status, intraoperative blood loss, postoperative gastrointestinal recovery time, postoperative fever, abdominal pain, and recurrence were independent risk factors for the development of negative emotions in patients (Table 6 and Figure 2).

Table 4 Ovarian Reserve Function Indicators in Patients with or Without Negative Emotions

Item (Mean±SD)	Preoperative FSH (mIU/mL)	Preoperative LH (mIU/mL)	Preoperative E2 (pmol/L)	Preoperative AMH (ng/mL)
With negative emotions	5.53±0.63	6.48±1.57	203.77±17.50	5.67±0.55
Without negative emotions	5.51±0.60	6.21±1.40	201.12±17.06	5.62±0.55
t	−0.171	−1.202	−0.978	−0.596
P	0.865	0.230	0.329	0.551
With negative emotions	11.26±1.24	10.86±1.89	175.20±17.02	3.79±0.68
Without negative emotions	10.86±1.16	9.39±2.12	169.26±18.7	3.51±0.53
t	−2.150	−4.508	−2.029	−3.062
P	0.032	0.000	0.043	0.002

Abbreviations: FSH, Follicle stimulating hormone; LH, Luteinizing hormone; E2, Estradiol; AMH, Anti-mullerian hormone.

Table 5 Complications in Patients with or Without Negative Emotions

Item (N, %)	Fever		Abdominal Pain		Infection		Hemorrhage		Abdominal Adhesions		Recurrence	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
With negative emotions	5(10.6)	42(89.4)	4(8.5)	43(91.5)	3(6.4)	44(93.6)	0(0.0)	47(100.0)	1(2.1)	46(97.9)	6(12.8)	41(87.2)
Without negative emotions	8(3.1)	253(96.9)	5(1.9)	256(98.1)	3(1.1)	258(98.9)	2(0.8)	259(99.8)	2(0.8)	259(99.2)	11(4.2)	250(95.8)
X^2	5.650		6.107		5.711		0.363		0.765		5.585	
P	0.017		0.013		0.017		0.382		0.382		0.018	

Table 6 Binary Logistic Regression Analysis of Patients' Negative Emotion

Related Factor	B	SE	Wald	P	OR	95% CI	
						Upper	Lower
Age	0.428	0.500	0.732	0.392	1.534	4.085	0.576
Fertility or not	−1.144	0.551	4.315	0.038	0.319	0.937	0.108
Spouse or not	0.135	0.564	0.057	0.811	1.144	3.456	0.379
Monthly household income	−0.858	0.404	4.516	0.034	0.424	0.935	0.192
Basic diseases	−0.036	0.502	0.005	0.943	0.965	2.583	0.361
Maximum diameter of cyst	1.120	0.439	6.522	0.011	3.066	7.246	1.298
Cyst site	0.360	0.411	0.767	0.381	1.433	3.205	0.641
Pelvic adhesions	1.243	0.402	9.563	0.002	3.466	7.621	1.576
Menstrual status	1.131	0.514	4.849	0.028	3.099	8.481	1.132
Intraoperative bleeding loss	0.042	0.019	4.771	0.029	1.043	1.082	1.004
Gastrointestinal function recovery time	0.623	0.275	5.118	0.024	1.864	3.198	1.087
Hospitalization time	0.133	0.087	2.345	0.126	1.143	1.355	0.963
Fever	2.164	0.684	10.008	0.002	8.708	33.284	2.278
Abdominal pain	2.298	0.869	6.989	0.008	9.959	54.731	1.812
Infection	1.869	1.056	3.133	0.077	6.482	51.348	0.818
Recurrence	1.306	0.657	3.955	0.047	3.691	13.364	1.019

Abbreviations: SE, standard error; OR, odds ratio; CI, confidence interval.

The PQRS Score One Month After the Surgery of the Patients

The results of the *t*-test showed that one month after surgery, the scores of patients in the negative emotion group were significantly lower ($P < 0.05$) than those in the without negative emotion group for the physiological domain, emotive domain, activities of the daily living domain, cognitive domain, and overall evaluation domain, but not for the nociceptive domain. The scores of the negative affective group were 20.47 ±3.15, 6.64 ±1.61, 9.11 ±1.96, 19.19 ±3.08, and 9.47 ±2.49 for the physiological domain, emotive domain, activities of the daily living domain, cognitive domain, and overall evaluation domain, respectively, while the scores of the non-negative affective group were 22.43 ±3.12, 7.98 ±1.12, 9.85 ±1.13, 21.45 ±2.78, 11.36 ±2.48, and 80.21 ±6.44, respectively. The mean total score was 71.91 ±7.81 in the group with negative emotions and 80.21 ±6.44 in the group without combined negative emotions, and the difference between the two groups was significant ($P < 0.05$) (Table 7).

Linear Logistic Regression Analysis of the PQRS Score

The results of the linear regression analysis showed that the presence of combined negative emotions, the presence of underlying disease, the maximum diameter of the cyst, the location of the cyst, postoperative co-infection, abdominal

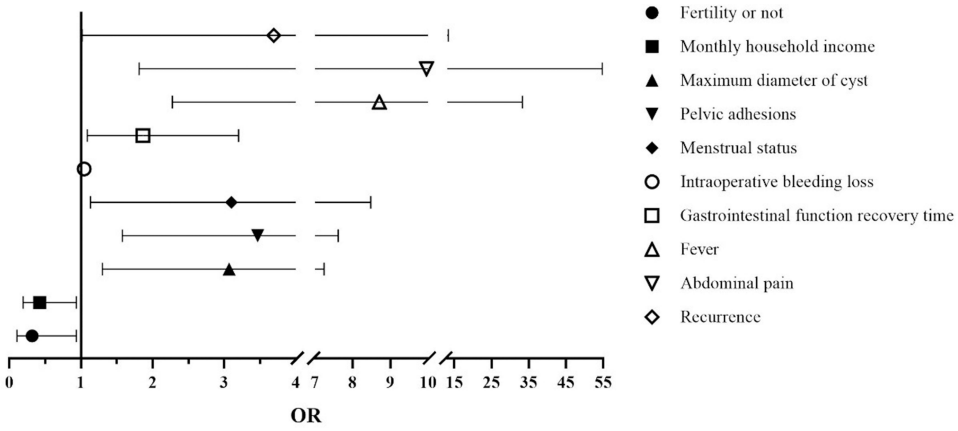

Figure 2 Binary logistic regression analysis of patients' negative emotion.

Table 7 PQRS in 1 Month After Surgery of Patients in Two Groups

Item (Mean±SD)	Physiological Domain	Nociceptive Domain	Emotive Domain	Activities of Daily Living Domain	Cognitive Domain	Overall Evaluation Domain	Total
With negative emotions	20.47±3.15	7.04±1.22	6.64±1.61	9.11±1.96	19.19±3.08	9.47±2.49	71.91±7.81
Without negative emotions	22.43±3.12	7.15±1.09	7.98±1.12	9.85±1.13	21.45±2.78	11.36±2.48	80.21±6.44
t	3.953	0.609	7.024	3.653	5.040	4.812	7.864
P	0.000	0.543	0.000	0.000	0.000	0.000	0.000

Abbreviation: PQRS, Post-operative quality recovery scale.

Table 8 Linear Logistic Regression Analysis of PQRS Score

Related Factor	B	SE	t	P
Basic diseases	2.977	0.864	3.444	0.001
With negative emotions	−6.625	1.137	−5.825	0.000
Age of menarche	0.091	0.729	0.125	0.901
Maximum diameter of cyst	−2.203	0.968	−2.274	0.024
Cyst site	−2.863	0.782	−3.663	0.000
Pelvic adhesions	−0.171	0.803	−0.214	0.831
Course of disease (year)	−0.593	0.745	−0.796	0.427
Menstrual status	1.187	0.778	1.526	0.128
Fever	0.087	1.804	0.048	0.962
Abdominal pain	−0.592	2.168	−0.273	0.785
Infection	−5.593	2.671	−2.094	0.037
Hemorrhage	−2.446	4.452	−0.549	0.583
Abdominal adhesions	−10.236	3.717	−2.754	0.006
Recurrence	−4.232	1.628	−2.599	0.010
Postoperative CRP (mg/L)	0.111	0.110	1.009	0.314
Preoperative IL-6 (ng/L)	0.180	0.131	1.376	0.170
Preoperative IL-2 (ug/mL)	−1.584	0.747	−2.121	0.035
Preoperative PCT (ug/L)	0.751	0.451	1.666	0.097
Preoperative FSH (mIU/mL)	0.701	0.310	2.257	0.025
Preoperative LH (mIU/mL)	−0.173	0.174	−0.991	0.322
Preoperative E2 (pmol/L)	−0.040	0.020	−2.068	0.040
Preoperative AMH (ng/mL)	−1.299	0.648	−2.004	0.046

Abbreviations: PQRS, Post-operative quality recovery scale; SE, standard error; CRP, C-reactive protein; IL-2, Interleukin 2; IL-6, Interleukin 6; PCT, Procalcitonin; FSH, Follicle stimulating hormone; LH, Luteinizing hormone; E2, Estradiol; AMH, Anti-mullerian hormone.

adhesions, recurrence, postoperative IL-2, postoperative FSH, postoperative E2, and postoperative AMH were independent risk factors for the prognosis of patients (Table 8).

Discussion

Ovarian cysts are one of the most common gynecologic tumors[23] and are found in approximately 5–15% of women of childbearing age.[4] They are common female genital lesions that can destroy the parenchymal structure of the ovary, causing patients to suffer from menstrual disorders and infertility. Some patients with ovarian cysts are also at risk of cancer, which significantly affect their life and health.[24] The treatment of ovarian cysts varies from maintenance to surgical procedures depending on the type, size, and imaging findings of the cyst, especially the laparoscopic ovarian cyst debridement.[11,25] Laparoscopic cystectomy is the gold standard for the surgical management of recalcitrant adnexal masses due to the risk, potential rupture, or malignancy associated with ovarian cysts.[26,27] With the continuous advancement in laparoscopic techniques, the diagnostic capabilities of laparoscopy have increased considerably.

Nezhat et al[28] and the American Association of Gynecologic Laparoscopists in 1990 showed that the incidence of undetected ovarian cancer at laparoscopy was only 0.04%.[29] Additionally, benign cysts can be removed laparoscopically with good postoperative results in most cases.[30] Laparoscopic treatment can be used to remove the cyst accurately without removing ovarian tissues, which has a better protective effect on the patient's reproductive function. During laparoscopy, the surgical field is clear, which can reduce misses, and the postoperative pain of the patient is mild, which can accelerate the physical recovery and improve the satisfaction of patients.[31] Its surgical effect is equivalent to that of open surgery, and patients experience lesser surgical trauma, milder postoperative pain, and faster recovery. Therefore, laparoscopy is the preferred procedure for treating ovarian cysts.[32]

However, other unavoidable postoperative complications that occur after laparoscopy might arise, which largely increase the physical burden of patients and, thus, make them susceptible to negative emotions. As the results of this study showed, postoperative combinations of fever, abdominal pain, infection, and recurrence all can increase the likelihood of negative emotions in patients. Besides postoperative complications, we found that the presence of children, monthly household income, the maximum diameter of the cyst, abdominal adhesions, menstrual status, intraoperative blood loss, and time to recover from the postoperative gastrointestinal function were also independent risk factors for the development of negative emotions in patients. Ovarian cysts or debulking surgery can damage the ovarian function of the patient, which might decrease their fertility. Thus, patients without children are more likely to have negative emotions than those with children. Family income is a direct reflection of the family's financial situation. As patients cannot earn during surgery and recuperation, the financial pressure of the family directly impacts psychological pressure on the patient, and therefore, the probability of depression is higher for such patients. The relationship between menstrual disorders and psychological disorders is mutually influential. Regarding performance, menstrual disorders adversely affect the daily life of women and their social interactions, which in turn can increase the psychological burden. Psychological disorders might lead to the occurrence of menstrual disorders by aggravating endocrine and metabolic disorders. Excessive intraoperative blood loss and long postoperative recovery time of gastrointestinal functions might make patients doubt the treatment effect and increase their psychological burden. In such cases, the medical staff needs to pay attention to the emotional value of patients, besides administering drugs, so that patients can remain in a relaxed and happy state. The medical staff should also have a sincere and gentle attitude, provide better care and show more companionship, patiently listen to patients and show empathy, understand the feelings of patients, and monitor their psychological and emotional changes, to develop relevant psychological intervention measures. For patients with low family income, the cost of treatment needs to be reduced by enhancing the efficacy of treatment, and personalized treatment plans need to be made to reduce the psychological burden of patients and the economic burden on their families by combining the conditions of the patients and their families. The patient's indicators also need to be monitored at all times, and timely measures should be taken to prevent complications to improve the patient's prognosis.

We also found that negative mood significantly affected the prognosis of patients and was an independent risk factor affecting the prognosis of patients. Patients in the combined negative affect group had significantly lower scores in physical function, emotion, activities of daily living, cognitive function, and overall patient evaluation than those in the non-combined negative affect group. Additionally, the presence or absence of underlying diseases, the maximum diameter of the cyst, location of the cyst, postoperative co-infection, abdominal adhesions, recurrence, postoperative IL-2, postoperative FSH, postoperative E2, and postoperative AMH were also independent risk factors for the prognosis of patients. Patients with ovarian cysts had significantly lower immune functions and compensatory functions in the postoperative period, which significantly increased the risk of infection. IL-2 is a cytokine of the chemokine family. It controls the differentiation and balance of pro-inflammatory T cells and anti-inflammatory T cells.[33] Therefore, an increase in IL-2 levels indicates more severe inflammation in patients, which can lead to an imbalance of homeostasis in the body, resulting in a poor prognosis of patients. Ovarian cystectomy can decrease ovarian reserve.[34,35] Assessing the levels of AMH, FSH, and LH is an important way to determine ovarian reserve function.[36,37] For example, AMH is a glycoprotein dimer secreted by the granulosa cells of the antral primary follicles. The serum AMH level is suitable for testing ovarian reserve because it fluctuates slightly throughout the menstrual cycle.[38,39] In contrast, some studies reported a significant decrease in the AMH levels in the third and sixth months after ovarian cystectomy compared to the AMH levels in the preoperative period;[40–42] these results were similar to those found in our study. This is probably

due to the lack of a clear demarcation between the cyst and ovary during ovarian cystectomy, which might lead to the accidental removal of healthy ovarian tissue, thus destroying the follicles and reducing the postoperative quality of life of the patients.[43] In conclusion, many risk factors affect the occurrence of negative emotions and the prognosis of patients with ovarian cysts. Medical personnel should identify relevant risk factors quickly, provide the best possible treatment environment, communicate effectively with patients, provide effective psychological guidance, and improve the treatment compliance of patients, to decrease the occurrence of negative emotions. Implementing these strategies might help improve the overall treatment effect and accelerate the recovery of patients.

The sample size of this study was small due to the limited time and shortage of researchers. Future researchers need to include more participants to conduct a more comprehensive study. For example, expand the sample size and extend the follow-up time, pay attention to the follow-up SAS and SDS changes of patients, and analyze the possible causes.

Conclusion

In clinical work, identifying the independent risk factors for negative emotions and enhancing their behavioral awareness and self-efficacy is necessary to improve their quality of life after surgery. Meanwhile, we will continue our exploration of the causes of negative emotions in patients in the future.

Highlights

Key findings

- Negative emotions have a significant influence on the prognosis of patients with ovarian cyst. Depending on individual differences, this should be supplemented with targeted interventions to stabilize the patient's mood in order to improve the patient's prognosis.

What is known and what is new?

- Negative emotions (such as anxiety and depression) have lots of independent risk factors.
- Negative emotions have a significant influence on the prognosis of patients with ovarian cyst.
- Apart from negative emotions, it has many independent risk factors for prognosis of patients with ovarian cyst.

What is the implication, and what should change now?

- During treatment of ovarian cyst, clinical attention should be paid to patients' emotions, early identification of relevant risk factors, and targeted measures to alleviate patients' anxiety and depression, thereby improving their prognosis and postoperative quality of life.

Ethical Statement

The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by Ethics Committee of Wuxi Maternal and Child Health Hospital and informed consent was obtained from all patients.

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Disclosure

The authors have no conflicts of interest to declare.

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