Original Article

Analysis of risk factors for negative emotions in perioperative period of ovarian cancer patients and their impact on prognosis

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Background: Ovarian cancer (OC), a common malignant tumor of the female reproductive system, has the highest mortality rate among gynecologic cancers. Female patients often experience negative emotions such as anxiety and depression due to sex hormone disorders, fear of cancer, and unfamiliarity with the hospital environment. This study aimed to elucidate the risk factors of negative emotions in the perioperative period of OC patients and their effect on prognosis to provide a reference basis for improving patients' prognosis.

Methods: We retrospectively analyzed the data of 258 patients with OC at our hospital between August 2014 and December 2019. The *t*-test and chi-square test were used to analyze the relationship between patients' negative emotions and prognosis. Binary logistic regression was used to analyze the independent risk factors for the occurrence of negative emotions and poor prognosis in patients.

Results: Binary logistic regression analysis showed that young age, low monthly household income, low education, no children, lymph node metastasis, postoperative chemotherapy, time to postoperative bowel function recovery ≥24 hours, and the presence of postoperative complications such as irregular bleeding and pressure sores were independent risk factors for negative emotions in patients. Furthermore, negative emotions were found to be an important independent risk factor for patients' prognosis. In patients with negative emotions, the survival rate at 2 and 3 years after surgery was significantly lower compared with patients without negative emotions, and the recurrence rate at 3 years after surgery was significantly higher than in patients without negative emotions.

Conclusions: In the perioperative period of OC, patients are prone to anxiety, depression, and other psychological disorders, which seriously affect the treatment effect. Therefore, in clinical work, patients' negative emotions should be predicted as early as possible, and active communication with patients and timely psychological counseling should be provided. Improve surgical accuracy and reduce the complication rate.

Keywords: Ovarian cancer (OC); negative emotion; prognosis; anxiety; depression

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Introduction

Ovarian cancer (OC) is a malignant tumor that can occur in any histological part of the ovary, including the epithelium, stroma, or germ cells. Among these, high-grade plasmacytoma arising from ovarian epithelium is the most common type (1). Of gynecologic cancers, OC has the third highest incidence after cervical cancer and uterine corpus cancer, accounting for approximately 4% of all malignant tumors in women (2). According to global cancer statistics, in 2020 there were 310,000 new cases of OC and 200,000 deaths worldwide, and its incidence and mortality rate ranked 8th among female malignancies (3). In China, about 50,000 women are diagnosed with OC every year (4). The occurrence of OC is insidious, and effective screening and early diagnosis measures are lacking. At the time of diagnosis, 75% of OC patients are already at an advanced stage (5). Depending on the type of OC pathology, the 5-year survival rate of Federation International of Gynecology and Obstetrics (FIGO) stage III and IV patients ranges from 23.9% to 37.0% (6). The prognosis of advanced OC is poor, with a 5-year survival rate of less than 20% (7,8). Moreover, it has been shown that even after complete remission with first-line therapy, approximately 70–85% of OC patients will experience recurrence, and the median survival of these patients is 12–24 months (9). In addition, OC is highly invasive and metastatic, readily transporting tumor cells to many organs and tissues throughout the body by blood and lymphatic metastasis, which can lead to various adverse symptoms, including thromboembolism, blood complications, and infections, among others. The complications caused by cancer metastasis or invasion are also the main causes of death in OC patients (10,11). Therefore, OC remains one of the most dangerous gynecologic cancers and a serious threat to women's lives and health. However, the etiology of OC is still unclear, and its development may be related to age, fertility, blood type, psychological factors, and environment (12).

Current clinical treatment for OC involves surgery supplemented with chemotherapy, and there is an emphasis on comprehensive treatment. However, the disease itself and its treatment process can produce many adverse effects (13). The treatment process for OC is relatively long, and the initial treatment of surgery and chemotherapy can cause serious physical and psychological burdens (14). A study has shown that OC patients suffer from severe long-term fatigue, depression, neuropathy, and sleep disorders after treatment (15). In addition, patients with OC may experience negative emotions during the perioperative period due to their instinctive fear of malignancy or inadequate knowledge of OC itself and the treatment process. Another common reason for patients' negative emotions is their fear and worry about tumor recurrence, which is common among OC patients (16,17). For OC patients, fear of recurrence or progression raises the high likelihood of cancer recurrence (18). A study by Li *et al.* (19) showed that depressive symptoms in OC patients prior to diagnosis were associated with decreased OC survival. Another study showed that while many OC survivors reported few unmet physical needs, they recognized a large number of unmet psychological needs (20). These studies indicate that the importance of quality of life and psychological well-being of OC patients is receiving increasing attention. However, there are fewer studies on the impact of negative emotions on patient prognosis in perioperative OC patients. The aim of this study was to compare the clinical characteristics and postoperative complications between patients with and without negative emotions and to elucidate the independent risk factors affecting patients' negative emotions and prognosis to provide a reference for the early identification of high-risk groups in clinical practice and the adoption of targeted measures to reduce postoperative complications, improve patients' prognosis, and enhance their postoperative quality of life. We present the following article in accordance with the STROBE reporting

Highlight box

Key findings

- Negative emotions can significantly affect the prognosis of ovarian cancer (OC) patients. Clinically, patients should be communicated with and helped to grasp relevant medical knowledge in order to stabilize their emotions in order to improve their prognosis.

What is known and what is new?

- Patients with OC have a higher incidence of negative emotions.
- Negative emotions can lead to higher rates of complications and reduced quality of life in the patients with OC.

What is the implication, and what should change now?

- During the treatment of OC, in addition to paying attention to the patient's condition, attention should be paid to the patient's mood and early detection of relevant risk factors. Relevant psychological care should be provided to relieve patients' anxiety and depression when necessary, so as to improve patients' prognosis and postoperative quality of life.

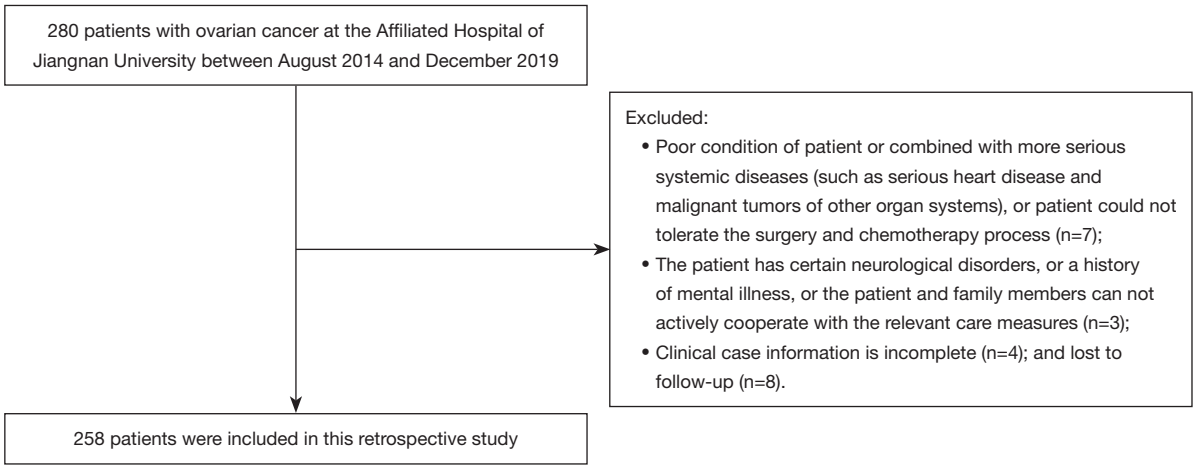

Figure 1 Flow chart of patient selection.

checklist (available at https://gs.amegroups.com/article/view/10.21037/gs-23-94/rc).

Methods

Research participants

A total of 258 OC patients admitted to the Affiliated Hospital of Jiangnan University between August 2014 and December 2019 were included in this study.

The inclusion criteria were: (I) patients diagnosed with OC by medical history, symptoms, physical signs, and adjuvant and histopathological examinations, and patients had obvious indications for surgery and chemotherapy; (II) patients and family members signed informed consent, had good compliance, and could actively cooperate with medical and nursing staff for corresponding treatment and care; (III) patients had good understanding and cooperation ability; and (IV) clinical data were complete.

The exclusion criteria were: (I) poor condition of patient or combined with systemic diseases such as serious heart disease, malignant tumors of other organ systems, or could not tolerate the surgery and chemotherapy process; (II) the patient had certain neurological disorders, a history of mental illness, or the patient and family members could not actively cooperate with the relevant care measures; and (III) clinical case information was incomplete (*Figure 1*).

Binary logistic regression requires a ratio of item number to sample size of 1:5–1:10. Therefore, the sample size of the study population planned for this study was 280 cases. On the basis of the exclusion criteria, 22 cases were excluded, including 8 lost to follow-up, and 258 cases were finally included in the study. The study was approved by the ethics committee of The Affiliated Hospital of Jiangnan University (No. KYLC2014262). The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). Informed consent was obtained from all patients.

General information questionnaire

The general information questionnaire included demographic data [gender, age, body mass index (BMI), address, monthly family income, education level, fertility, and marital status] and clinical data (presence of hypertension, hyperlipidemia, diabetes, pathological type of OC, FIGO staging, maximum tumor diameter, pathological histological type, presence of ascites, presence of lymph node metastasis, residual postoperative lesions, postoperative chemotherapy or not, time to postoperative bowel function recovery, and length of hospitalization, among others).

Negative emotion assessment

A self-rating anxiety scale (SAS) was used to reflect the existence and degree of anxiety, which consisting of 20 items, each rated from 1–4. The scores for each item were summed to obtain a crude score and then multiplied by 1.25 to provide a standard score. The SAS scores of 50–59, 60–69, and ≥70 were defined as mild, moderate, and severe anxiety, respectively. The scale had good reliability and validity, and Cronbach's α coefficients were above 0.75.

A self-rating depression scale (SDS) was used to reflect

the existence and degree of depression, also consisting of 20 items. An SDS score >52 was used as the evaluation criterion. An SDS score of 53–62, 63–72, and >72 were defined as mild, moderate, and severe depression, respectively. The SDS had good reliability and validity, and Cronbach's α coefficients were above 0.75. Whether the patient has anxiety or depression or both, it is defined as co-negative emotion. All patients were assessed by SAS and SDS 1 day before discharge.

Postoperative recurrence

Postoperative recurrence was defined as any 2 of the following occurring after 6 months of complete remission with treatment: elevated tumor marker levels, mass detected by computed tomography (CT)/magnetic resonance imaging (MRI), mass on physical examination, unexplained bowel obstruction, and the presence of pleural effusion or ascites. The last follow-up occurred in December 2022.

Ovarian function assessment

The ovarian cross-sectional area, resistance index (RI), peak systolic blood flow velocity (PSV), and end-diastolic blood flow velocity (EDV) were measured by transvaginal color Doppler ultrasound before surgery and 3 months after surgery. The last follow-up occurred in March 2020.

Prognostic assessment of Functional Assessment of Cancer Therapy-Ovarian (FACT-O)

The FACT-O (21) consists of a core scale for all cancer patients (the Functional Assessment of Cancer Therapy-General, FACT-G V4.0) and an additional 12-item module for OC. The assessment contains 39 items in 5 domains, including physical status (7 items), social/family status (7 items), emotional status (6 items), functional status (7 items), and an OC-specific module (12 items). The quality-of-life questionnaire was administered to patients during follow-up assessments at two different stages of treatment, 1 month postoperatively and 6 months postoperatively. This scale has been used worldwide and has good reliability, validity, and response.

Each item was scored on a five-point scale from 0 to 4 according to the degree of disease impact, i.e., "not at all, some, average, quite a lot, very much". The scores of the corresponding items were summed, with high scores indicating high quality of life and low scores indicating low quality of life. Some items in the middle were inverse items, and positive conversion was performed when calculating the scores of these items. The last follow-up visit occurred in June 2020.

Statistical analysis

The results of each scale were entered into a computer for score conversion, and statistical analysis was performed using SPSS 26 (IBM Corp., Armonk, NY, USA). Measurement data are expressed as mean and standard deviation, and count data are expressed as frequencies and percentages. Statistical analysis between the two groups (with and without negative emotions) was performed using *t*-test and chi-square test, and independent risk factors for assessing patients' prognosis were analyzed using binary logistics regression. $P<0.05$ was considered statistically significant.

Results

Baseline data

Baseline data of the patients are shown in *Table 1*. A total of 258 patients with OC were included in this study. There were significant differences in SAS and SDS scores between the two groups in terms of age, marital status, presence of diabetes, lymph node metastasis, postoperative chemotherapy, and time to postoperative bowel function recovery in patients with or without combined negative emotions ($P<0.05$). For age, the 124 patients (48.1%) with age <40 had a mean SAS score of 45.36±6.65 and a mean SDS score of 46.00±7.29, while the 134 patients (51.9%) with age ≥40 had a mean SAS score of 43.89±5.30 and a mean SDS score of 43.73±6.11. The 54 cases (20.9%) with combined diabetes had a mean SAS score of 46.35±4.91 and mean SDS score of 46.91±7.16, while the 204 cases (79.8%) without combined diabetes had a mean SAS score of 44.13±6.21 and mean SDS score of 44.27±6.59. For marital status, the 20 patients (7.8%) who did not have a spouse had a mean SAS score of 47.50±5.71 and a mean SDS score of 49.90±6.46, both of which were significantly higher than those for patients with a spouse ($P<0.05$). A total of 66 patients (25.6%) had lymph node metastasis, with a mean SAS score of 47.33±6.63 and a mean SDS score of 47.27±7.08, while the 192 patients (74.4%) who did not have lymph node metastasis had a mean SAS score of 43.66±5.51 and a mean SDS score of 43.98±6.49. The 109 patients (42.2%) who received chemotherapy after

Table 1 SAS and SDS scores in patients with ovarian cancer

Item	N (%)	SAS			SDS		
		Mean ± SD	t	P	Mean ± SD	t	P
Age (years)			1.977	0.049		2.716	0.007
<40	124 (48.1)	45.36±6.65			46.00±7.29		
≥40	134 (51.9)	43.89±5.30			43.73±6.11		
BMI (kg/m^2)			0.058	0.954		1.590	0.113
<24	136 (52.7)	44.62±6.38			45.46±6.92		
≥24	122 (47.3)	44.57±5.63			44.11±6.60		
Have hypertension or not			0.055	0.956		0.006	0.995
Yes	88 (34.1)	44.57±5.84			44.82±6.81		
No	170 (65.9)	44.61±6.13			44.82±6.80		
Have hyperlipidemia or not			0.970	0.333		2.377	0.018
Yes	31 (12.0)	43.61±7.38			42.13±6.58		
No	227 (88.0)	44.73±5.82			45.19±6.75		
Have diabetes or not			–2.432	0.016		–2.568	0.011
Yes	54 (20.9)	46.35±4.91			46.91±7.16		
No	204 (79.8)	44.13±6.21			44.27±6.59		
Fertile or not			3.043	0.003		1.223	0.223
Have children	241 (93.4)	44.30±5.89			44.68±6.76		
No children	17 (6.6)	48.82±6.47			46.76±7.01		
Marital status			2.263	0.024		3.563	0.000
Have spouse	238 (92.2)	44.35±5.99			44.39±6.65		
No spouse	20 (7.8)	47.50±5.71			49.90±6.46		
Education level			–2.930	0.004		–1.195	0.233
High school and below	172 (66.7)	43.83±5.72			44.47±6.67		
High school or above	86 (33.3)	46.13±6.34			45.53±6.99		
Address			–0.177	0.859		0.423	0.673
Countryside	135 (52.3)	44.53±5.84			44.99±7.16		
City	123 (47.7)	44.67±6.24			44.63±6.37		
Monthly household income (yuan)			2.305	0.022		1.289	0.199
<5,000	135 (52.3)	45.41±5.83			45.34±7.06		
≥5,000	123 (47.7)	43.70±6.12			44.25±6.45		
Types of ovarian cancer			–0.451	0.653		0.869	0.386
Plasmacytoid	108 (41.9)	44.80±5.77			44.39±6.21		
Non-plasmacytoid	150 (58.1)	44.45±6.21			45.13±7.18		

Table 1 (*continued*)

Table 1 (*continued*)

Item	N (%)	SAS			SDS		
		Mean ± SD	t	P	Mean ± SD	t	P
FIGO staging			0.727	0.468		–0.228	0.820
I–II	81 (31.4)	45.00±5.37			44.68±6.82		
III–IV	177 (68.6)	44.41±6.30			44.89±6.79		
Maximum diameter of tumor			–0.103	0.918		–0.972	0.332
≥3 cm	44 (17.1)	44.68±5.46			45.73±6.78		
<3 cm	214 (82.9)	44.58±6.14			44.64±6.79		
Pathological histological type			0.476	0.634		0.966	0.335
Low and medium differentiation	175 (67.8)	44.72±5.25			45.10±7.14		
High differentiation	83 (32.2)	44.34±7.41			44.23±5.98		
With ascites or not			–0.265	0.791		–0.934	0.351
Yes	56 (21.7)	44.79±5.57			45.57±6.96		
No	202 (78.3)	44.54±6.23			44.61±6.74		
Lymph node metastasis			–4.433	0.000		–3.474	0.001
Yes	66 (25.6)	47.33±6.63			47.27±7.08		
No	192 (74.4)	43.66±5.51			43.98±6.49		
Residual postoperative lesion			–0.750	0.454		–1.215	0.225
≥1 cm	91 (35.3)	44.98±5.96			45.52±5.69		
<1 cm	167 (64.7)	44.39±6.06			44.44±6.83		
Postoperative chemotherapy or not			–1.573	0.117		–3.046	0.003
Yes	109 (42.2)	45.28±5.83			46.30±7.01		
No	149 (57.8)	44.09±6.13			43.74±6.43		
Time to bowel function recovery			–1.214	0.226		–2.279	0.023
≥24 h	96 (37.2)	45.19±5.73			46.06±7.19		
<24 h	162 (62.8)	44.25±6.18			44.09±6.45		
Length of hospitalization			–2.174	0.031		–1.861	0.064
≥10 d	113 (43.8)	45.51±6.47			45.71±7.38		
<10 d	145 (56.2)	43.88±5.56			44.13±6.22		

SAS, self-rating anxiety scale; SDS, self-rating depression scale; SD, standard deviation; BMI, body mass index; FIGO, Federation International of Gynecology and Obstetrics.

surgery had a mean SAS score of 45.28±5.83 and a mean SDS score of 46.30±7.01, both of which were significantly higher than for those who did not receive chemotherapy (P<0.05). A total of 96 patients (37.2%) whose postoperative bowel function recovery time was ≥24 hours had a mean SAS score of 45.19±5.73 and a mean SDS score of 46.06±7.19, which were significantly higher than those who had passed gas within 24 hours of surgery (P<0.05). For combined hyperlipidemia, there was a significant difference between the two groups in terms of SDS score only (P<0.05). A total of 31 patients (12.0%) had combined hyperlipidemia and their mean SDS score was 42.13±6.58,

Table 2 Complications in patients with or without negative emotions

Item	Subcutaneous emphysema		Urinary tract infection		Deep vein thrombosis		Irregular bleeding		Pressure sores		Intestinal adhesions	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Without negative emotions	1 (14.3)	42 (16.7)	5 (38.5)	38 (15.5)	3 (25.0)	40 (16.3)	7 (36.8)	36 (15.1)	5 (50.0)	38 (15.3)	4 (22.2)	39 (16.3)
With negative emotions	6 (85.7)	209 (83.3)	8 (61.5)	207 (84.5)	9 (75.0)	206 (83.7)	12 (63.2)	203 (84.9)	5 (50.0)	210 (84.7)	14 (77.8)	201 (83.8)
χ^2	0.029		4.682		0.629		6.011		8.323		0.430	
P	0.864		0.030		0.428		0.014		0.004		0.512	

Data are shown as n (%).

while the 227 patients (88.0%) who did not have combined hyperlipidemia had a mean SDS score of 45.19±6.75. For SAS scores, there were significant differences between the two groups in terms of the presence of children, educational level, monthly household income, and length of hospitalization (P<0.05). Among the patients, 17 (6.6%) had no children, and their mean SAS score was 48.82±6.47, while 241 patients (93.4%) had children, and their mean SAS score was 44.30±5.89, which was significantly lower than the score of those without children. The 86 patients (33.3%) with high school or higher education had a mean SAS score of 46.13±6.34, and the 172 patients (66.7%) with high school or lower education had a mean SAS score of 43.83±5.72. The mean SAS score was 45.41±5.83 for the 135 patients (52.3%) with monthly family income <5,000 and 43.70±6.12 for the 123 patients (47.7%) with monthly family income ≥5,000. A total of 113 patients (43.8%) were hospitalized for ≥10 days, and their mean SAS score was 45.51±6.47, while 145 patients (56.2%) were hospitalized for <10 days, and their mean SAS score was 43.88±5.56.

Complications in patients with or without negative emotions

Analysis of the results by chi-square test showed that urinary tract infection, irregular bleeding, and pressure ulcers were significantly different (P<0.05) between patients with combined negative emotions and those without negative emotions. Among the patients without combined negative emotions, 5 (38.5%) had urinary tract infections, 7 (36.8%) had irregular postoperative bleeding, and 5 (50.0%) had pressure sores. Among patients with combined negative emotions, 8 (61.5%) developed urinary tract infections, 12 (63.2%) had irregular postoperative bleeding, and 5 (50.0%) had pressure sores (*Table 2*).

Binary logistic regression analysis of patients' negative emotion

Binary logistic regression analysis showed that age, monthly household income, education level, being fertile or not, whether lymph nodes were metastatic, whether postoperative chemotherapy was given, the time to postoperative bowel function recovery, and whether postoperative complications such as irregular bleeding and pressure sores occurred were independent risk factors for patients' negative emotions (*Table 3*, *Figure 2*).

Comparison of ovarian function between the two groups of patients before and after surgery

The results of *t*-test analysis showed that there was no significant difference between the two groups of patients with and without combined negative emotions in all assessments of preoperative ovarian function. At 3 months postoperatively, there was a significant difference in PSV, RI, and EDV (P<0.05) between the two groups. Among patients with combined negative emotions, mean PSV was 17.57±0.76 cm/s, mean RI was 0.58±0.06, and mean EDV was 7.56±0.58 cm/s. Among patients without combined negative emotions, mean PSV was 17.28±0.66 cm/s, mean RI was 0.61±0.07, and mean EDV was 7.32±0.45 cm/s (*Table 4*).

FACT-O of patients in two groups after surgery in 1 and 6 months

T-test analysis showed statistically significant differences

Table 3 Binary logistic regression analysis of patients' negative emotions

Related factor	B	SE	Wald	P	OR	95% CI	
						Upper	Lower
Age (years)	–1.000	0.426	5.513	0.019	0.368	0.848	0.160
Have diabetes or not	0.354	0.473	0.559	0.455	1.425	3.603	0.563
Have hyperlipidemia or not	0.459	0.589	0.606	0.436	1.582	5.019	0.499
Monthly household income (yuan)	–1.159	0.432	7.189	0.007	0.314	0.732	0.135
Education level	1.059	0.406	6.794	0.009	2.885	6.399	1.301
Fertile or not	–1.495	0.671	4.969	0.026	0.224	0.835	0.060
Have spouse or not	–0.154	0.655	0.055	0.814	0.857	3.096	0.237
Lymph node metastasis	0.902	0.412	4.800	0.028	2.465	5.525	1.100
Postoperative chemotherapy	0.839	0.417	4.054	0.044	2.314	5.238	1.023
Time to bowel function recovery	0.809	0.409	3.912	0.048	2.245	5.001	1.007
Length of hospitalization	0.424	0.419	1.022	0.312	1.528	3.473	0.672
Urinary tract infection	0.867	0.786	1.218	0.270	2.380	11.098	0.510
Irregular bleeding	1.388	0.629	4.872	0.027	4.008	13.754	1.168
Pressure sores	2.163	0.770	7.893	0.005	8.699	39.348	1.923

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

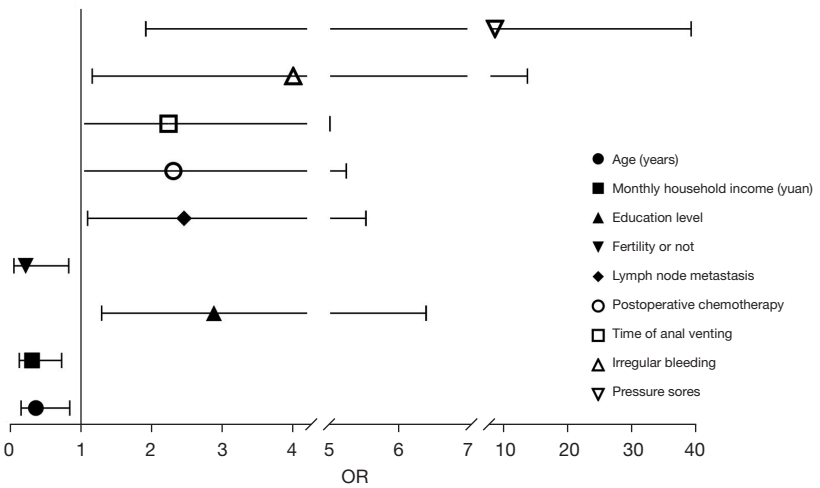

Figure 2 Binary logistic regression analysis of patients' negative emotions. OR, odds ratio.

between the two groups in the 3 dimensions of emotional well-being, functional well-being, and FACT-O at 1 month postoperatively (P<0.05). Among the patients with combined negative emotions, the score for emotional well-being was 16.09±3.50, functional well-being was 16.98±3.11, and FACT-O was 94.70±6.61. Meanwhile, among the patients without combined negative emotions, the score for emotional well-being was 17.61±2.76, functional well-being was 18.05±2.31, and FACT-O was 98.09±6.04. Patients with combined negative emotions had significantly lower scores in all 3 areas compared with those without combined negative emotions.

Table 4 Comparison of ovarian function between the two groups of patients before and after surgery

Item	Time	With negative emotions	Without negative emotions	t	P
Ovarian cross-sectional area (cm^2)	Preoperative	4.16±0.54	4.20±0.53	0.533	0.595
	3 months postoperative	3.84±0.55	3.82±0.53	–0.266	0.790
PSV (cm/s)	Preoperative	16.34±0.53	16.39±0.60	0.493	0.622
	3 months postoperative	17.57±0.76	17.28±0.66	–2.593	0.010
RI	Preoperative	0.69±0.06	0.68±0.06	–1.018	0.309
	3 months postoperative	0.58±0.06	0.61±0.07	2.758	0.006
EDV (cm/s)	Preoperative	7.04±0.41	7.01±0.42	–0.521	0.603
	3 months postoperative	7.56±0.58	7.32±0.45	–3.125	0.002

Data are shown as mean ± SD. PSV, peak systolic blood flow velocity; RI, resistance index; EDV, end-diastolic blood flow velocity; SD, standard deviation.

The differences between the two groups were statistically significant (P<0.05) in the 5 dimensions of physical well-being, emotional well-being, functional well-being, ovarian subscale, and FACT-O at 6 months postoperatively. Among the patients with combined negative emotions, the score for physical well-being was 15.35±3.18, emotional well-being was 13.14±1.79, functional well-being was 18.14±3.16, ovarian subscale was 29.81±1.72, and FACT-O score was 94.40±5.12. In patients without combined negative emotions, the score for physical well-being was 18.94±2.21, emotional well-being was 19.54±2.05, functional well-being was 19.53±2.64, ovarian subscale was 33.74±3.25, and FACT-O was 110.38±5.69. Patients with combined negative emotions had significantly lower scores in all 5 areas compared with those without combined negative emotions (*Table 5*, *Figure 3*).

Survival rate and recurrence rate 1–3 years after surgery in two groups

The results of chi-square test analysis showed that there was a significant difference between the two groups of patients in the recurrence rate at 3 years postoperatively and the survival rate at 2 and 3 years postoperatively (P<0.05). The survival rate of patients in the group with negative emotions was 65.1% 2 years after surgery and 44.2% 3 years after surgery, and the survival rate of patients in the group without negative emotions was 80.9% 2 years after surgery and 65.1% 3 years after surgery. The survival rates of patients in the group with negative emotions were significantly lower than those in the group without negative emotions at 2 and 3 years postoperatively. The recurrence rate at 3 years after surgery was 72.1% in the group with negative emotions, while it was 54.9% in the group without negative emotions. The recurrence rate at 3 years after surgery was significantly higher in the group with negative emotions compared with the group without negative emotions (*Table 6*, *Figure 4*).

Binary logistic regression analysis of patients' prognosis

Negative emotions, pathological type, FIGO stage, maximum tumor diameter, histological type, with or without ascites, postoperative lesion residual size, whether postoperative chemotherapy was given, and whether postoperative complications such as subcutaneous emphysema, deep vein thrombosis, and intestinal adhesions occurred were independent risk factors for patients' prognosis (*Table 7*, *Figure 5*).

Discussion

According to statistics, there were 295,414 new cancer cases and 184,799 cancer deaths in the United States in 2018 (22). Worldwide, 314,000 OC cases and 207,300 deaths were reported in 2020, with incidence and death standardized rates of 6.6/100,000 and 4.2/100,000, respectively (23). After the occurrence of OC, a large amount of abdominal fluid appears, causing symptoms such as abdominal distension and decreased appetite, and if effective treatment measures are not taken in time, it can lead to symptoms such as wasting, anemia, and multiorgan failure, and even endanger patients' lives (24). The general 5-year survival rate of early-stage OC is about 70–

Table 5 FACT-O of patients in two groups at 1 and 6 months after surgery

Item	Physical well-being		Social/family well-being		Emotional well-being		Functional well-being		Ovarian subscale		FACT-O	
	1-m after surgery	6-m after surgery	1-m after surgery	6-m after surgery	1-m after surgery	6-m after surgery	1-m after surgery	6-m after surgery	1-m after surgery	6-m after surgery	1-m after surgery	6-m after surgery
With negative emotions	16.28±2.58	15.35±3.18	17.33±2.06	17.95±2.06	16.09±3.50	13.14±1.79	16.98±3.11	18.14±3.16	28.02±1.61	29.81±1.72	94.70±6.61	94.40±5.12
Without negative emotions	16.97±2.68	18.94±2.21	17.19±2.32	18.62±2.43	17.61±2.76	19.54±2.05	18.05±2.31	19.53±2.64	28.28±2.54	33.74±3.25	98.09±6.04	110.38±5.69
t	1.546	7.064	−0.367	1.678	2.689	19.054	2.143	3.057	0.851	11.446	3.312	17.081
P	0.123	0.000	0.714	0.094	0.010	0.000	0.037	0.002	0.397	0.000	0.001	0.000

Data are shown as mean ± SD. FACT-O, Functional Assessment of Cancer Therapy-Ovarian; m, months; SD, standard deviation.

80% (25). However, in advanced stage (stage III/IV) OC, the 5-year overall survival (OS) rate is less than 30% (26). Surgery is currently an important clinical treatment approach for OC, and it can rapidly remove tumor tissues and inhibit disease progression (27). However, patients suffer from multiple stress factors, including pain caused by the disease itself, trauma of surgery and chemotherapy, and high treatment costs, which often lead to negative emotions such as anxiety, depression, and even fear, seriously affecting their treatment outcome and quality of life. Therefore, medical professionals are paying more and more attention to patients' mental health issues.

The results of this study showed that age, monthly family income, education level, being fertile or not, whether lymph nodes were metastasized, whether chemotherapy was given postoperatively, the time to postoperative bowel function recovery, and whether postoperative complications such as irregular bleeding and pressure sores occurred were independent risk factors for the development of negative emotions in patients. Influenced by our traditional thinking, family members give more importance to genetically-related children. The pressure to have children, the absence of sexual organs, and the fear of high mortality often lead to patients becoming vulnerable to psychological problems. In addition, progesterone and estrogen in the female body can directly affect a woman's mood by influencing neurotransmitter transmission and neuroendocrine function. The removal of ovaries causes a large change in estrogen and progesterone in women's bodies, which makes them more prone to negative emotions such as anxiety. Family income directly reflects the economic status of the family. Patients may feel that they are burdening their families and loved ones and may have no source of income during surgery and recuperation, and thus their psychological stress is higher, and the probability of depression is also higher. The lymphatic system is the main diffusion pathway of gynecologic malignancies (28), and patients who have lymph node metastasis often think their prognosis is hopeless, have low treatment motivation, and have a weak desire to live. Postoperative chemotherapy will kill normal cells as well as cancer cells, which will have a certain negative impact on the patient's body and cause many adverse reactions, thus affecting the patient's psychology, and some patients become depressed because they cannot tolerate the adverse reactions brought on by treatment. The long recovery time of intestinal function after surgery and the occurrence of complications will result in further physical and mental suffering and lead patients to doubt the

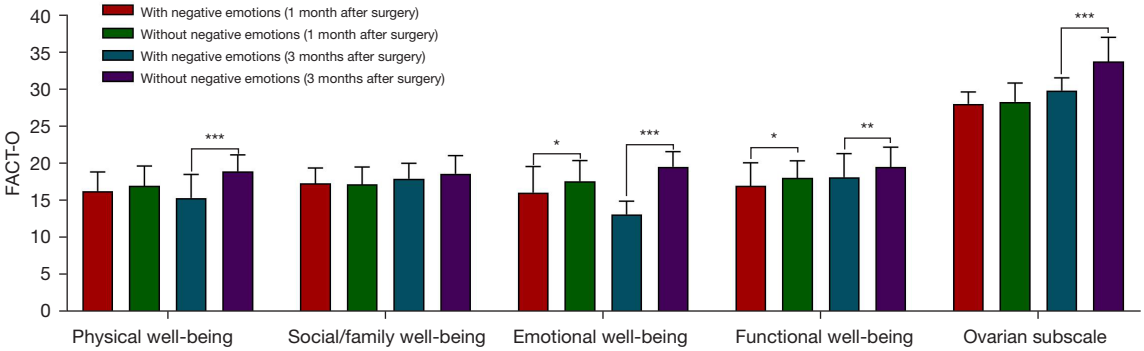

Figure 3 FACT-O of patients in two groups 1 and 3 months after surgery. *, P<0.05; **, P<0.01; ***, P<0.001. FACT-O, Functional Assessment of Cancer Therapy-Ovarian.

Table 6 Survival rate and recurrence rate 1–3 years after surgery in two groups

Item	1 year after surgery		2 years after surgery		3 years after surgery	
	Survival rate	Recurrence rate	Survival rate	Recurrence rate	Survival rate	Recurrence rate
With negative emotions	86.0%	37.2%	65.1%	51.2%	44.2%	72.1%
Without negative emotions	88.8%	26.0%	80.9%	42.3%	65.1%	54.9%
χ^2	0.272	2.219	5.273	1.137	6.638	4.350
P	0.602	0.136	0.022	0.286	0.010	0.037

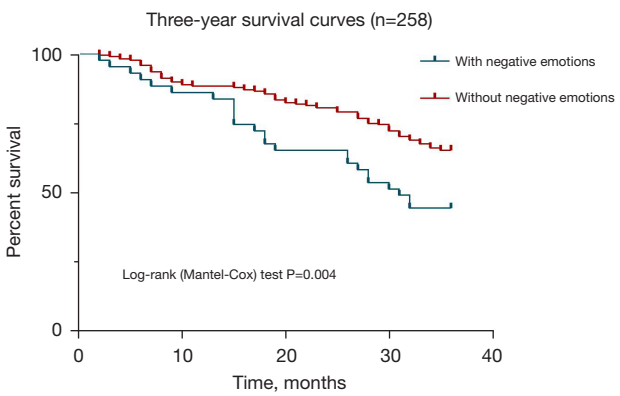

Figure 4 Kaplan-Meier survival curve between the group with negative emotions and group without negative emotions.

effect of treatment, which will increase the psychological burden of patients. Therefore, in clinical work, while actively treating patients, we should also pay attention to their emotional needs, encourage them, actively provide psychological comfort and emotional support, ensure the efficacy of treatment based on the lowest possible treatment costs for low-income patients, and in accordance with the patient and their family's condition, provide personalized treatment plans to reduce the psychological and economic burden on the patient and their family. At the same time, the patient's indicators should be monitored at all times, and timely measures should be taken to prevent complications to improve the patient's prognosis.

The results of this study also found that the development of negative emotions could seriously affect the prognosis of patients. Negative emotions were an independent influencing factor on patient prognosis. In this study, RI decreased and PSV and EDV increased in both groups at 3 months after surgery, but RI in patients with combined negative emotions was lower than those in the group without negative emotions, and PSV and EDV were both higher than those in the group without negative emotions. Because the tumor tissue is in a high metabolic state during the development of OC, neovascularization is an important pathological feature of OC and the pathological basis for cancer cell invasion and abnormal proliferation. Usually, new tumor blood vessels are characterized by high permeability of the wall, few smooth muscle structures, and numerous arteriovenous short circuits, so the blood flow parameters of malignant tumors are characterized by

Table 7 Binary logistic regression analysis of patients' prognosis

Related factor	B	SE	Wald	P	OR	95% CI	
						Upper	Lower
With negative emotion or not	–1.361	0.492	7.655	0.006	0.256	0.672	0.098
Age (years)	–0.182	0.333	0.298	0.585	0.834	1.601	0.434
BMI (kg/m^2)	0.534	0.334	2.548	0.110	1.705	3.285	0.885
Have hypertension or not	0.227	0.343	0.440	0.507	1.255	2.456	0.641
Have hyperlipidemia or not	0.849	0.547	2.405	0.121	2.338	6..836	0.799
Have diabetes or not	0.169	0.419	0.163	0.686	1.184	2.691	0.521
Fertile or not	–1.024	0.698	2.152	0.142	0.359	1.411	0.091
Have spouse or not	0.961	0.597	2.588	0.108	2.614	8.432	0.811
Education level	–0.025	0.340	0.006	0.941	0.975	1.899	0.501
Address	0.137	0.318	0.186	0.667	1.147	2.138	0.615
Monthly household income (yuan)	0.162	0.331	0.241	0.623	1.176	2.249	0.615
Types of ovarian cancer	–0.733	0.333	4.833	0.028	0.480	0.924	0.250
FIGO staging	–0.935	0.373	6.278	0.012	0.393	0.816	0.189
Maximum diameter of tumor	–1.100	0.462	5.679	0.017	0.333	0.823	0.135
Pathological histological type	–0.696	0.346	4.037	0.045	0.499	0.983	0.253
With ascites or not	–0.867	0.398	4.760	0.029	0.420	0.916	0.193
Lymph node metastasis	–0.241	0.375	0.414	0.520	0.786	1.638	0.377
Residual postoperative lesion	–0.818	0.341	5.752	0.016	0.441	0.861	0.226
Postoperative chemotherapy	0.914	0.349	6.846	0.009	2.494	4.947	1.258
Time to bowel function recovery	0.570	0.355	2.584	0.108	1.769	3.545	0.882
Length of hospitalization	0.440	0.358	1.508	0.220	1.553	3.135	0.769
Subcutaneous emphysema	–2.182	1.095	3.970	0.046	0.113	0.965	0.013
Urinary tract infection	–0.542	0.830	0.426	0.514	0.582	2.961	0.114
Deep vein thrombosis	–2.772	1.171	5.604	0.018	0.063	0.621	0.006
Irregular bleeding	–0.676	0.688	0.966	0.326	0.509	1.958	0.132
Pressure sores	0.248	0.866	0.082	0.775	1.281	6.999	0.235
Intestinal adhesions	–1.348	0.651	4.281	0.039	0.260	0.931	0.072

BMI, body mass index; FIGO, Federation International of Gynecology and Obstetrics; SE, standard error; OR, odds ratio; CI, confidence interval.

high flow velocity and low resistance (29). Decreased blood flow resistance and increased blood flow velocity imply the deterioration of OC, and this result indicates that the recovery of ovarian function after surgery is significantly worse in patients presenting negative emotions than in those without negative emotions. In addition, the survival rate at 2 and 3 years after surgery was significantly lower in patients with negative emotions than in patients without negative emotions, and the recurrence rate at 3 years after surgery was significantly higher than in patients without negative emotions. These results suggested that patients with combined negative emotions have a worse prognosis.

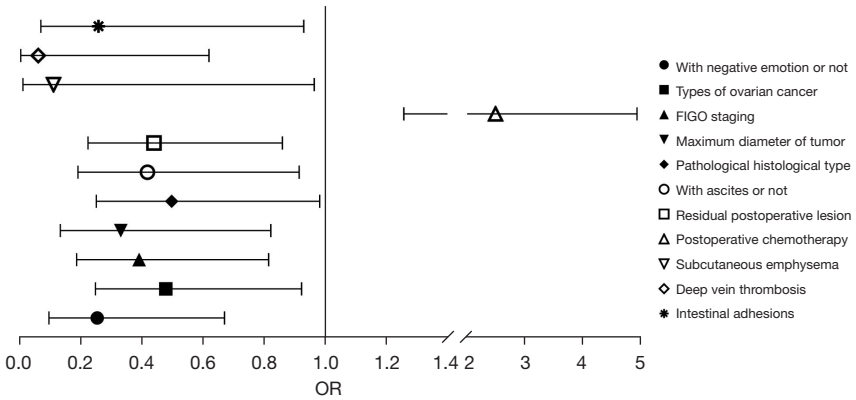

Figure 5 Binary logistic regression analysis of patients' prognosis. FIGO, Federation International of Gynecology and Obstetrics; OR, odds ratio.

Furthermore, the results of this study found that, in addition to negative emotions, pathological type, FIGO stage, maximum tumor diameter, histological type, with or without ascites, and size of residual postoperative lesions were also independent risk factors affecting the prognosis of OC patients. Each pathological type has its own unique tumor biology affecting the prognosis of the disease. Among all OCs, high-grade plasmacytoma is the most common subtype and is responsible for 70–80% of all OC-related deaths (30). Lan *et al.* (31) found that low-grade plasmacytoma, high-grade plasmacytoma, and carcinosarcoma are usually at advanced stages at diagnosis and have much higher lymph node and distant metastases compared to other tissue types. Regardless of stage, high-grade plasmacytoma has the worst prognosis. Median OS and median progression-free survival (PFS) of OC patients with relevant clinicopathologic factors have been studied in a large number of multifactorial analyses, confirming that FIGO stage is a very meaningful prognostic factor in OC, and patients with early stage are significantly better off than those with advanced stage in terms of prognosis (32). Patients with early FIGO stage can have more complete resection of the lesion during surgery, and because the residual lesion is relatively small, it is more sensitive to chemotherapy, and thus there is a lower risk of recurrence and metastasis. Therefore, these patients have a good prognosis. Patients with advanced FIGO stage have more widespread tumor cells, thus complete resection is more difficult to achieve, and drug resistance in chemotherapy is more likely, leading to a worse prognosis (33). Previous study has found that histological grading is an important factor affecting prognosis (34). Tissue with low differentiation and higher stage indicates higher tumor progression, which can lead to extensive tumor spread and implantation, making surgery more complicated, and as it is difficult to completely resect the lesion, cancer cells are more likely to invade blood vessels and lymphatic tissues and deepen infiltration, leading to tumor metastasis and high risk of recurrence after surgery (35,36). Ascites is the accumulation of excess fluid in the peritoneal cavity, and as a microenvironment for tumor inflammation and immunosuppression, it contains various cytokines, chemokines, and growth factors which can increase tumor aggressiveness and decrease the ability of drug metabolism, including tumor cell shedding (37,38). In addition, it has been found that malignant ascites can provide a microenvironment for tumor cells to promote inflammation and carcinogenesis, increasing the risk of postoperative recurrence (39). For the prognostic impact of postoperative residual lesions, Tseng *et al.* (40) analyzed clinical data and found residual lesions to be an independent risk factor for prognosis. Postoperative residual size >1 cm leads to residual cancer cells that remain unavoidable and also increases the risk of recurrence (41), thus shortening survival.

In conclusion, there are many factors that affect the appearance of negative emotions in OC patients, and combined negative emotions can seriously affect patients' prognosis. Therefore, clinical personnel should identify relevant risk factors in a timely manner and actively provide psychological guidance to improve treatment compliance, thereby reducing complications and improving postoperative quality of life for patients.

Due to limited time and manpower, the sample size of

this study was small, and a larger sample size is necessary for an in-depth study in the future to provide a reference basis for improving the prognosis of OC patients.

Conclusions

In the perioperative period of OC, patients are prone to anxiety, depression, and other psychological disorders, which seriously affect the treatment effect. Therefore, in clinical work, patients' negative emotions should be predicted as early as possible, and active communication with patients and timely psychological counseling should be provided. Improve surgical accuracy and reduce the complication rate.

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Footnote

Reporting Checklist: The authors have completed the STROBE reporting checklist. Available at https://gs.amegroups.com/article/view/10.21037/gs-23-94/rc

Data Sharing Statement: Available at https://gs.amegroups.com/article/view/10.21037/gs-23-94/dss

Peer Review File: Available at https://gs.amegroups.com/article/view/10.21037/gs-23-94/prf

Conflicts of Interest: Both authors have completed the ICMJE uniform disclosure form (available at https://gs.amegroups.com/article/view/10.21037/gs-23-94/coif). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). Informed consent was obtained from all patients. The study was approved by the ethics committee of The Affiliated Hospital of Jiangnan University (No. KYLC2014262).

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