



Cohort analysis of relevant factors for negative emotions during the perioperative period in choledocholithiasis patients treated with ERCP and the impact on prognosis

Xinyu Li^{1,2}, Wei Zhang², Zijing Pan^{1,2}, Rongwei Shen^{1,2}

¹School of Medicine, Jiangsu University, Zhenjiang, China; ²Department of Gastroenterology, Affiliated Hospital of Jiangsu University, Zhenjiang, China

Contributions: (I) Conception and design: X Li; (II) Administrative support: W Zhang; (III) Provision of study materials or patients: X Li, Z Pan, R Shen; (IV) Collection and assembly of data: All authors; (V) Data analysis and interpretation: All authors; (VI) Manuscript writing: All authors; (VII) Final approval of manuscript: All authors.

Correspondence to: Wei Zhang, MD. Department of Gastroenterology, Affiliated Hospital of Jiangsu University, No. 438, Jiefang Road, Jingkou District, Zhenjiang 212001, China. Email: Zw8839200@163.com.

Background: Endoscopic retrograde cholangiopancreatography (ERCP) is an emerging option in the management of common bile duct stones and has a high success rate for biliary stone extraction. However, due to the lack of knowledge and understanding of this technique, some patients often experience varying degrees of anxiety and depression. There is little research on the factors associated with negative emotions. This study aimed to investigate the risk factors for negative emotions in choledocholithiasis patients treated with ERCP and the impact on prognosis to provide a reference for improving patients' prognosis.

Methods: We analyzed the data of 364 patients with choledocholithiasis treated with ERCP at our hospital between July 2019 and June 2022. Patients' emotional state was assessed using the SAS and SDS scales. The *t*-test and chi-square test were used to analyze the relationship between patients' negative emotions and prognosis. The patient's prognosis was assessed at one month postoperatively using the SF-36 scale. Binary logistic regression and multiple linear regression were used to analyze the independent risk factors for negative emotions and prognosis in patients.

Results: In this study, the prevalence of anxiety was 10.4%, the prevalence of depression was 8.8% and the prevalence of negative emotions was 15.4%. Binary logistic regression analysis showed that gender [odds ratio (OR) =0.379, P=0.023], fertility status (OR =0.164, P=0.032), monthly household income (OR =0.180, P=0.001) and so on were independent risk factors for the anxiety. Fertility status (OR =0.173, P=0.038), marital status (OR =0.210, P=0.043), TBIL on the first postoperative day (OR =1.079, P=0.002) and so on were independent risk factors for depression. Multiple linear regression analysis revealed that the presence of negative emotions (P=0.001) was an important risk factor for prognosis.

Conclusions: Patients with choledocholithiasis treated with ERCP are prone to anxiety, depression and other psychological disorders. Therefore, clinical work should not only focus on the patient's condition, but also pay attention to the patient's family situation and emotional changes, and give timely psychological counselling and prevent complications, reduce the patient's suffering and improve the patient's prognosis.

Keywords: Choledocholithiasis; endoscopic retrograde cholangiopancreatography (ERCP); negative emotions; prognosis

Submitted Mar 22, 2023. Accepted for publication May 17, 2023. Published online May 29, 2023.

doi: 10.21037/gs-23-150

View this article at: <https://dx.doi.org/10.21037/gs-23-150>

Introduction

Choledocholithiasis is a common gastrointestinal disease and often presents with vague pain or colic in the upper abdomen, jaundice, and high fever. Some patients also develop complications that seriously affect their health, including liver function impairment, acute cholangitis, and biliary tract infection (1). Primary common bile duct stones (CBDSs) are those formed directly in the biliary tree, while secondary CBDSs migrate from the gallbladder (2). In patients with gallbladder stones, 10–20% have combined CBDSs (3). Common clinical manifestations in patients with choledocholithiasis are right-sided abdominal pain and yellowing of the skin or eyes. Patients may also present with clay-colored stools and dark urine. In most cases, the migration of stones into the common bile duct (CBD) often leads to obstruction of bile flow in the small intestine, resulting in pain, jaundice, and sometimes cholangitis (4,5). In addition, the inability of pancreatic enzymes to flow smoothly to the small intestine can lead to gallstone pancreatitis, causing nausea, vomiting, and pain in the right, middle, and left upper abdomen. Acute cholecystitis may develop if the gallbladder is concurrently infected due to bacterial growth, or cholangitis can occur if the ducts through which the bile flows are infected. Both of these conditions cause pain in the right abdomen, nausea, vomiting, and fever in patients (6).

Since the early 1990s, laparoscopic cholecystectomy

(LC) has been considered the gold standard for the treatment of cholelithiasis (7), while endoscopic retrograde cholangiopancreatography (ERCP) is selected for isolated CBDSs (5). Currently, there is no consensus on the treatment of CBDSs (8,9). ERCP is a common imaging tool in the diagnosis and treatment of biliary and pancreatic system diseases, with the advantages of being minimally invasive and having wide indications and high safety. ERCP can be used in conjunction with endobiliary stenting and papillary sphincterotomy for stone extraction and is gradually becoming the preferred option for the treatment of biliary and pancreatic diseases (10).

However, ERCP is still prone to various complications, including biliary tract infection, cholecystitis, gastrointestinal bleeding, and even serious complications such as pancreatitis, among others. The results of a study by Huang-Fu *et al.* (11) showed that the incidence of complications during hospitalization after ERCP was as high as 19.6%, including 5.7% for acute pancreatitis, 2.6% for cholecystitis, and 2.1% for gastrointestinal bleeding. The occurrence of post-ERCP complications seriously affects the prognosis of patients and significantly reduces their quality of life (11). In addition to postoperative complications, many factors influence patient prognosis. A study by Mertens *et al.* (12) showed that, in addition to clinical symptoms, high trait anxiety was a predictor of negative symptom outcomes at 6 weeks after cholecystectomy. Study has shown that patients with gallstones are more likely than other surgical patients to experience negative emotions while waiting for surgery. It is more likely to perceive anxiety, which affects the quality of life and leads to limited social interaction (13). However, there is little research on the factors associated with negative emotions and the prognosis of patients after ERCP for choledocholithiasis. The aim of this study was to compare the differences in laboratory parameters and postoperative complications in patients in two groups to identify independent risk factors for negative emotions and prognosis so that targeted measures could be taken to reduce postoperative complications and improve the prognosis of patients, as well as to fill the knowledge gap of previous studies. We present this article in accordance with the STROBE reporting checklist (available at <https://gs.amegroups.com/article/view/10.21037/gc-23-150/rc>).

Methods

A total of 364 patients with choledocholithiasis admitted

Highlight box

Key findings

- Anxiety and depression have a significant impact on many aspects of patients with choledocholithiasis. Depending on individual differences, treatment should be supplemented with targeted interventions to stabilize the patient's mood in order to reduce complications and improve the patient's prognosis.

What is known and what is new?

- There are many patients with choledocholithiasis having the anxiety and depression emotions.
- Anxiety and depression have a poor impact on the prognosis of patients with choledocholithiasis.

What is the implication, and what should change now?

- During the process of treatment for choledocholithiasis with ERCP, clinical attention should be paid to patients' emotions to ensure early to reduce the psychological burden of patients and targeted measures to improve patient compliance, thereby improving their prognosis and postoperative quality of life.

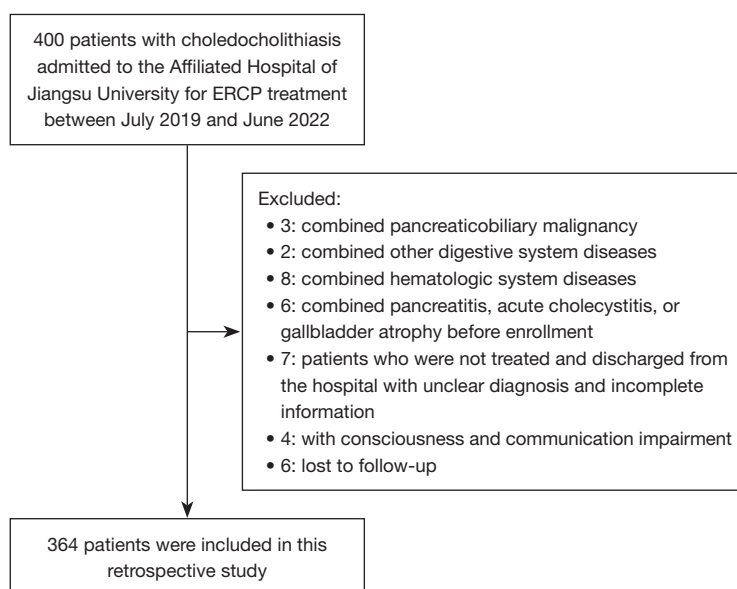


Figure 1 Flow chart of patient selection. ERCP, endoscopic retrograde cholangiopancreatography.

to the Affiliated Hospital of Jiangsu University for ERCP treatment between July 2019 and June 2022 were included in this study.

The inclusion criteria were: (I) patients who met the diagnostic criteria for choledocholithiasis and had indications for ERCP, (II) patients had normal cognitive function and comprehension, (III) no organic lesions of vital organs such as heart and lungs, (IV) complete clinical case information, (V) age ≥ 18 years, and (VI) those who voluntarily signed the informed consent.

The exclusion criteria were: (I) combined pancreaticobiliary malignancy; (II) combined other digestive system diseases; (III) combined hematologic system diseases; (IV) combined pancreatitis, acute cholecystitis, or gallbladder atrophy before enrollment; (V) patients who were not treated and discharged from the hospital with unclear diagnosis and incomplete information; and (VI) patients with consciousness and communication impairment (*Figure 1*).

For the estimating of sample size, according to our previous studies, the incidence of negative emotions in patients with biliary calculus treated with ERCP during perioperative period is about 15%. The allowable error is 3%, the confidence level is $1-\alpha=0.95$, and the sample size to be investigated is $N=215$ by using PASS 15 software. Assuming that the non-response rate of the study object is 10%, the sample size is required $N=215\div 0.9=239$ cases. Assuming that the qualified rate of the questionnaire is 90%, the total sample size is $N=239\div 0.9=266$ cases. Finally,

the sample size of the study population planned for this study was 400 cases. With 36 attrition and lost cases, the final number was 364 cases.

The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by the ethics committee of Affiliated Hospital of Jiangsu University (No. KYLC2019425) and informed consent was taken from all the patients.

Research participants

General information questionnaire

The general information questionnaire included demographic data (e.g., gender, age, education level, place of residence, having children or not, marital status, and monthly household income, etc.) and clinical data (average diameter of CBD, number of CBDs, average diameter of CBDs, biliary pneumatosis or not, liver function and inflammatory indexes, postoperative complications, and recovery of postoperative intestinal function, etc.).

Negative emotion assessment

The Self-Rating Anxiety Scale (SAS) and self-rating depression scale (SDS) was used to reflect the existence and degree of anxiety and depression. The scale consists of 20 items, each rated from 1 to 4. Standardize by multiplying the total score by 1.25. The evaluation criteria were SAS score >50 , with 50–59 for mild anxiety, 60–69 for moderate

anxiety, and 70 and above for severe anxiety. The scale has good reliability and validity, with Cronbach's α coefficients above 0.75.

As for the SDS, the scale consists of 20 items, and an SDS score >52 was classified as depression, with 53–62 considered mild depression, 63–72 moderate depression, and >72 severe depression. The SDS has good reliability and validity, with Cronbach's α coefficients above 0.75.

Patients with SAS >50 or SDS >52 or both are defined as having negative emotions, and vice versa. We assessed the patient on the 10th postoperative day.

Visual Analogue Scale (VAS) score

The VAS measures a patient's perception of pain using a 10-cm line numbered at 1 cm intervals. The patient marks the value of their pain on the scale, with 0 representing no pain and 10 the most severe pain (14). We evaluated the patient on the 5th postoperative day.

The 36-Item Short Form Health Survey (SF-36) score

SF-36 is a popular questionnaire used to measure self-perceptions of quality of life in a specific population. The questionnaire consists of 36 questions on 8 dimensions: physical functioning, role limitations due to physical problems, bodily pain, general health, vitality, social functioning, role limitations due to emotional problems, and mental health. In addition, there are 2 summary scores, a physical component summary (PCS) and mental component summary (MCS), which are composed of physical or mental components, respectively. Each dimension is scored on a scale ranging from 0 to 100, with higher scores indicating higher quality of life (15).

We evaluated the patient at one month after the operation. The last follow-up visit occurred in July 2022.

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). Continuous data are expressed as mean and standard deviation, and categorical data are expressed as frequencies and percentages. Statistical analysis between groups was performed using *t*-test and chi-square test, and binary logistic regression and multiple linear regression were used to analyse independent risk factors contributing to negative emotions and prognosis for poor outcomes in perioperative patients. A two-sided *P* value <0.05 was regarded as statistical significance.

Results

Baseline data

Baseline data are shown in *Table 1*. The results of *t*-tests showed significant differences between SAS and SDS scores for gender, fertility status, and monthly household income ($P<0.05$). There were statistically significant differences in SAS scores for education level and mean CBDS diameter ($P<0.05$). There were significant differences in SDS scores for marital status and number of CBDSs ($P<0.05$).

Laboratory test indicators in patients with or without negative emotions on the first day after surgery

For the laboratory results on the first postoperative day, there were significant differences in tumor necrosis factor alpha (TBIL), tumor necrosis factor alpha (TNF- α), and white blood cells (WBC) for patients with and without negative emotions ($P<0.05$). Patients with negative emotions had TBIL of 30.90 ± 8.79 $\mu\text{mol/L}$, TNF- α of 3.97 ± 0.97 $\mu\text{g/L}$, and WBC of $(13.39\pm 2.97)\times 10^9/\text{L}$. Patients without negative emotions had TBIL of 25.96 ± 7.48 $\mu\text{mol/L}$, TNF- α of 3.69 ± 0.83 $\mu\text{g/L}$, and WBC of $(12.57\pm 2.48)\times 10^9/\text{L}$ (*Table 2*).

Complications which occurred in included patients

Of the patients who developed postoperative vomiting, 7 (33.3%) developed negative emotions, and 14 (66.7%) did not. Of the patients who developed postoperative bleeding, 6 (37.5%) developed negative emotions, and 10 (62.5%) did not. Among the patients with postoperative biliary fistula, 4 (44.4%) had negative emotions, and 5 (55.6%) had no negative emotions. For patients with postoperative negative emotions, the pain value was 2.68 ± 1.36 , while for patients without postoperative negative emotions, the pain value was 2.18 ± 1.22 . Among all the complications, the occurrence of postoperative vomiting, bleeding, biliary fistula, and pain were statistically significant between patients with and without negative emotions ($P<0.05$) (*Table 3*).

Recovery of intestinal function after surgery in patients with or without negative emotions

For patients' bowel function recovery after surgery, the 56 patients (15.4%) with negative emotions had a mean recovery time of 13.77 ± 2.87 h for bowel sounds, 19.41 ± 3.29 h for first postoperative flatus, and 32.09 ± 4.96 h for first postoperative bowel evacuation. The 308 patients

Table 1 SAS and SDS scores in patients with choledocholithiasis

Item	N (%)	SAS			SDS		
		Mean ± SD	t	P	Mean ± SD	t	P
Age			-0.764	0.445		0.438	0.662
<50 years	152 (41.8)	44.36±4.41			46.38±4.65		
≥50 years	212 (58.2)	44.75±5.12			46.15±5.16		
Gender			2.409	0.017		2.194	0.029
Male	190 (52.2)	44.01±4.67			45.71±4.68		
Female	174 (47.8)	45.22±4.95			46.84±5.18		
BMI			0.428	0.669		-0.635	0.526
<24 kg/m ²	209 (57.4)	44.68±4.61			46.11±5.09		
≥24 kg/m ²	155 (42.6)	44.46±5.14			46.44±4.76		
Fertility status			2.521	0.012		2.827	0.005
Children	353 (97.0)	44.48±4.80			46.12±4.93		
No children	11 (3.0)	48.18±4.85			50.36±4.03		
Marital status			1.541	0.124		2.575	0.010
Spouse	351 (96.4)	44.52±4.81			46.12±4.89		
No spouse	13 (3.6)	46.62±5.35			49.69±5.44		
Education level			-2.253	0.025		-1.175	0.241
High school and below	213 (58.5)	44.11±4.67			45.99±4.85		
High school or above	151 (41.5)	45.26±4.99			46.61±5.09		
Location			-0.392	0.695		-1.661	0.098
Countryside	183 (50.3)	44.49±4.77			45.82±5.02		
City	181 (49.7)	44.69±4.91			46.68±4.85		
Monthly household income			3.192	0.002		2.550	0.011
<5,000 yuan	184 (50.5)	45.38±4.91			46.90±4.94		
≥5,000 yuan	180 (49.5)	43.78±4.63			45.58±4.88		
Average diameter of common bile duct			0.072	0.943		0.746	0.456
<15 mm	247 (67.9)	44.60±4.85			46.38±4.80		
≥15 mm	117 (32.1)	44.56±4.82			45.97±5.26		
Number of common bile duct stones			-0.735	0.463		-2.503	0.013
<2	201 (55.2)	44.42±4.57			45.67±4.86		
≥2	163 (44.8)	44.80±5.15			46.96±4.99		
Average diameter of common bile duct stones			-2.063	0.040		-1.074	0.286
<14 mm	294 (80.8)	44.34±4.74			46.09±4.71		
≥14 mm	70 (19.2)	45.66±5.09			46.90±5.86		
Presence of bile duct pneumatization			-1.388	0.166		-1.467	0.146
Yes	68 (18.7)	45.32±5.14			47.12±5.56		
No	296 (81.3)	44.42±4.75			46.05±4.79		

SAS, self-rating anxiety scale; SDS, self-rating depression scale; SD, standard deviation; BMI, body mass index.

Table 2 Laboratory test indicators in patients with or without negative emotions on the first day after surgery

Item	N (%)	TBIL* ($\mu\text{mol/L}$)	ALP* (U/L)	ALT* (U/L)	AST* (U/L)	IL-6* ($\mu\text{g/L}$)	IL-8* ($\mu\text{g/mL}$)	TNF- α * ($\mu\text{g/L}$)	CRP* (mg/L)	WBC* ($\times 10^9/\text{L}$)
With negative emotions	56 (15.4)	30.90 \pm 8.79	82.09 \pm 10.61	53.37 \pm 11.47	55.21 \pm 16.53	5.54 \pm 1.14	0.40 \pm 0.07	3.97 \pm 0.97	12.76 \pm 2.96	13.39 \pm 2.97
Without negative emotions	308 (84.6)	25.96 \pm 7.48	81.83 \pm 14.79	52.00 \pm 10.85	55.55 \pm 14.73	5.73 \pm 1.14	0.39 \pm 0.08	3.69 \pm 0.83	12.61 \pm 3.51	12.57 \pm 2.48
t		-4.424	-0.126	-0.860	0.157	1.165	-0.177	-2.259	-0.310	-2.205
P		0.000	0.899	0.391	0.875	0.245	0.859	0.024	0.757	0.028

*, data are shown as mean \pm standard deviation. TBIL, total bilirubin; ALP, alkaline phosphatase; ALT, alanine aminotransferase; AST, aspartate aminotransferase; IL-6, interleukin-6; IL-8, interleukin-8; TNF- α , tumor necrosis factor alpha; CRP, C-reactive protein; WBC, white blood cell.

(84.6%) without negative emotions had a mean recovery time of 12.21 \pm 2.96 h for bowel sounds, 18.20 \pm 3.78 h for first postoperative flatus, and 28.69 \pm 5.59 h for first postoperative bowel evacuation. There were significant differences in the time to postoperative bowel sounds, flatus, and bowel evacuation between patients with and without negative emotions ($P < 0.05$) (Table 4).

Binary logistic regression analysis of patients' anxiety and depression

Binary logistic regression analysis showed that gender, fertility status, monthly household income, laboratory test indicators such as TBIL and TNF- α on the first postoperative day, postoperative complications such as vomiting, hemorrhage, and pain, and time to postoperative bowel evacuation were independent risk factors for anxiety, while fertility status, marital status, TBIL on the first postoperative day, postoperative complications such as biliary fistula and pain, and time to postoperative flatus were independent risk factors for depression (Tables 5,6).

Multiple linear regression analysis of SF-36 scores in patients at 1 month after surgery

At 3 months after the operation, the SF-36 vitality dimension score in patients with combined negative emotions was 63.79 \pm 7.26, the social functioning dimension score was 66.70 \pm 6.23, the score for role limitations due to emotional problems was 67.57 \pm 6.17, the mental health dimension score was 64.73 \pm 6.12, and the MCS score was 65.70 \pm 3.46. In addition, for patients with combined negative emotions, the physical functioning dimension score was 64.68 \pm 7.18, the score for role limitations due to physical problems was 66.84 \pm 7.23, the bodily pain dimension score was 63.57 \pm 7.88, the general health dimension score was 64.11 \pm 7.37, and the PCS score was 64.80 \pm 4.26. The scores of all dimensions except the social functioning dimension were significantly different between patients with and without negative emotions ($P < 0.05$) (Table 7).

Multiple linear regression analysis revealed that with or without negative emotions, average diameter of CBD, average diameter of CBDs, alkaline phosphatase (ALP) and TNF- α on the first postoperative day, occurrence of complications such as pancreatitis, perforation, biliary fistula, biliary tract infection, intrahepatic cholestasis, acute cholangitis, and postoperative pain, and time to postoperative bowel evacuation were independent risk

Table 3 Complications in patients with or without negative emotions

Complications	With negative emotions	Without negative emotions	χ^2/t	P
Vomiting			5.515	0.019
Yes	7 (33.3)	14 (66.7)		
No	49 (14.3)	294 (85.7)		
Pancreatitis			2.360	0.125
Yes	2 (40.0)	3 (60.0)		
No	54 (15.0)	305 (85.0)		
Hemorrhage			6.288	0.012
Yes	6 (37.5)	10 (62.5)		
No	50 (14.4)	298 (85.6)		
Perforation			2.360	0.125
Yes	2 (40.0)	3 (60.0)		
No	54 (15.0)	305 (85.0)		
Pulmonary infection			2.284	0.131
Yes	3 (33.3)	6 (66.7)		
No	53 (14.9)	302 (85.1)		
Biliary fistula			5.986	0.014
Yes	4 (44.4)	5 (55.6)		
No	52 (14.6)	303 (85.4)		
Biliary tract infection			0.068	0.794
Yes	2 (18.2)	9 (81.8)		
No	54 (15.3)	299 (84.7)		
Intrahepatic cholestasis			0.749	0.387
Yes	1 (33.3)	2 (66.7)		
No	55 (15.2)	306 (84.8)		
Acute cholangitis			0.760	0.383
Yes	1 (7.1)	13 (92.9)		
No	55 (15.7)	295 (84.3)		
Postoperative pain	2.68±1.36	2.18±1.22	-2.744	0.006

Data are shown as mean ± standard deviation or number (percentage).

factors for prognosis of MCS (*Table 8*). For prognosis of PCS, multiple linear regression analysis found with or without negative emotions, gender, average diameter of CBD, ALP, C-reactive protein (CRP), and WBC on the first postoperative day, occurrence of vomiting, pancreatitis, hemorrhage, perforation, pulmonary infection, biliary fistula, acute cholangitis, and postoperative pain were independent risk factors (*Table 9*).

Discussion

Gallstone disease is divided into extrahepatic bile duct stones, intrahepatic bile duct stones, and gallbladder stones based on the site of stones. CBDSs belong to a common category of extrahepatic bile duct stones. Gallstone disease is reported to occur in 5–22% of adults, of which 20% have CBDSs (16). It is a common biliary disease in

Table 4 Recovery of intestinal function after surgery in patients with or without negative emotions

Item	N (%)	Time to postoperative bowel sounds* (h)	Time to postoperative flatus* (h)	Time to postoperative bowel evacuation* (h)
With negative emotions	56 (15.4)	13.77±2.87	19.41±3.29	32.09±4.96
Without negative emotions	308 (84.6)	12.21±2.96	18.20±3.78	28.69±5.59
<i>t</i>		-3.648	-2.239	-4.259
P		0.000	0.026	0.000

*, data are shown as mean ± standard deviation.

Table 5 Binary logistic regression analysis of patients' anxiety

Related factor	B	SE	Wald	P	OR	95% CI	
						Upper	Lower
Gender	-0.970	0.427	5.149	0.023	0.379	0.876	0.164
Fertility status	-1.805	0.840	4.617	0.032	0.164	0.853	0.032
Education level	0.534	0.415	1.656	0.198	1.706	3.848	0.756
Monthly household income	-1.714	0.494	12.053	0.001	0.180	0.474	0.069
Average diameter of common bile duct stones	0.124	0.453	0.074	0.785	1.132	2.749	0.466
TBIL	0.052	0.024	4.939	0.026	1.054	1.104	1.006
TNF- α	0.535	0.232	5.333	0.021	1.707	2.687	1.084
WBC	0.098	0.072	1.838	0.175	1.103	1.270	0.957
Vomiting	2.120	0.666	10.148	0.001	8.334	30.718	2.261
Hemorrhage	1.468	0.659	4.960	0.026	4.342	15.812	1.193
Biliary fistula	1.140	1.004	1.287	0.257	3.125	22.375	0.437
Postoperative pain	0.408	0.159	6.552	0.010	1.504	2.055	1.100
Time to postoperative bowel sounds	0.178	0.120	2.221	0.136	1.195	1.511	0.945
Time to postoperative flatus	-0.143	0.102	1.990	0.158	0.867	1.057	0.710
Time to postoperative bowel evacuation	0.096	0.047	4.282	0.039	1.101	1.206	1.005

TBIL, total bilirubin; TNF- α , tumor necrosis factor alpha; WBC, white blood cell; SE, standard error; OR, odds ratio; CI, confidence interval.

clinical practice, mainly manifesting as high fever, colic, radiating back pain, chills, and jaundice, etc. It can have a serious impact on patients' quality of life and physical and mental health (17,18). Surgery is still the first choice for clinical treatment of CBDs (19). A study has reported that the gallbladder aids digestion and improves lipid metabolism (20), and thus its removal may have an impact on the metabolic balance of the body. In recent years, with the rapid development of minimally invasive treatment technology, ERCP biliary lithotomy has received great attention from gastroenterologists and gradually replaced

traditional open lithotripsy as it is minimally invasive and less costly, involves less physiological interference and pain to patients, and it clearly shows the bile duct site and bile duct stone pattern (21,22). However, precisely because ERCP is an emerging technique, patients lack knowledge and understanding of it compared to traditional open surgery, and some patients are prone to negative emotions. Our study found that gender, presence of children, presence of a spouse, and monthly household income were independent risk factors for the negative emotions. This may be due to the fact that progesterone and oestrogen

Table 6 Binary logistic regression analysis of patients' depression

Related factor	B	SE	Wald	P	OR	95% CI	
						Upper	Lower
Gender	-0.461	0.427	1.168	0.280	0.631	1.455	0.273
Fertility status	-1.753	0.843	4.325	0.038	0.173	0.904	0.033
Marital status	-1.559	0.770	4.101	0.043	0.210	0.951	0.047
Monthly household income	-0.617	0.442	1.950	0.163	0.540	1.283	0.227
Number of common bile duct stones	0.128	0.435	0.086	0.769	1.136	2.665	0.485
TBIL	0.076	0.024	9.958	0.002	1.079	1.130	1.029
TNF- α	0.409	0.247	2.747	0.097	1.505	2.440	0.928
WBC	0.022	0.077	0.083	0.774	1.022	1.188	0.880
Vomiting	-0.204	0.895	0.052	0.820	0.816	4.717	0.141
Hemorrhage	0.563	0.752	0.561	0.454	1.757	7.674	0.402
Biliary fistula	2.036	0.883	5.323	0.021	7.663	43.227	1.359
Postoperative pain	0.318	0.158	4.072	0.044	1.375	1.872	1.009
Time to postoperative bowel sounds	0.211	0.124	2.894	0.089	1.235	1.576	0.968
Time to postoperative flatus	-0.225	0.112	4.046	0.044	0.799	0.994	0.642
Time to postoperative bowel evacuation	0.097	0.050	3.783	0.052	1.102	1.215	0.999

TBIL, total bilirubin; TNF- α , tumor necrosis factor alpha; WBC, white blood cell; SE, standard error; OR, odds ratio; CI, confidence interval.

Table 7 SF-36 scores at 3 months after surgery in patients with or without negative emotions

Variables	With negative emotions	Without negative emotions	t	P
Vitality	63.79 \pm 7.26	67.10 \pm 7.08	3.209	0.001
Social functioning	66.70 \pm 6.23	67.85 \pm 7.34	1.103	0.271
Role limitations–emotional	67.57 \pm 6.17	73.43 \pm 6.62	6.155	0.000
Mental health	64.73 \pm 6.12	67.16 \pm 6.81	2.494	0.013
Mental component summary	65.70 \pm 3.46	68.88 \pm 3.48	6.312	0.000
Physical functioning	64.68 \pm 7.18	67.27 \pm 8.12	2.231	0.026
Role limitations–physical	66.84 \pm 7.23	69.23 \pm 8.45	1.992	0.047
Bodily pain	63.57 \pm 7.88	70.64 \pm 7.32	6.239	0.000
General health	64.11 \pm 7.37	68.48 \pm 7.52	4.017	0.000
Physical component summary	64.80 \pm 4.26	68.91 \pm 4.26	6.631	0.000

Data are shown as mean \pm standard deviation. SF-36, The MOS (Medical Outcomes Study) 36-Item Short Form Health Survey.

in women affect neurotransmitter transmission and neuroendocrine function, thus indirectly affecting women's mood. In addition, both oestrogen and progesterone are more susceptible to negative emotions such as anxiety because of the large changes that occur during the menstrual

cycle and in stressful situations (23,24). In addition, it has been found that marital status and family relationships affect patients' mood (25). Patients without children and spouses are often more prone to negative emotions due to the stress of living alone and worries about their future.

Table 8 Multiple linear regression analysis of SF-36 scores for mental component summary

Related factor	B	SE	t	P
With negative emotions or not	-1.731	0.511	-3.390	0.001
Average diameter of common bile duct (mm)	-0.628	0.182	-3.431	0.001
Average diameter of common bile duct stones (mm)	0.430	0.197	2.179	0.030
ALP (U/L)	-0.031	0.011	-2.752	0.006
TNF- α (μ g/L)	-0.727	0.192	-3.782	0.000
Pancreatitis	-5.451	1.443	-3.777	0.000
Perforation	-3.220	1.431	-2.250	0.025
Biliary fistula	-2.324	1.044	-2.225	0.027
Biliary tract infection	-4.978	0.996	-4.997	0.000
Intrahepatic cholestasis	-5.357	1.818	-2.947	0.003
Acute cholangitis	-1.863	0.839	-2.222	0.027
Postoperative pain	-0.570	0.130	-4.389	0.000
Time to postoperative bowel evacuation (h)	-0.129	0.042	-3.045	0.003

SF-36, The MOS (Medical Outcomes Study) 36-Item Short Form Health Survey; ALP, alkaline phosphatase; TNF- α , tumor necrosis factor alpha; SE, standard error.

Table 9 Multiple linear regression analysis of SF-36 scores for physical component summary

Related factor	B	SE	t	P
With negative emotions or not	-1.844	0.579	-3.183	0.002
Gender	-0.766	0.373	-2.055	0.041
Average diameter of common bile duct (mm)	-0.586	0.207	-2.825	0.005
ALT (U/L)	-0.053	0.017	-3.117	0.002
CRP (mg/L)	-0.170	0.054	-3.178	0.002
WBC ($\times 10^9$ /L)	-0.181	0.073	-2.488	0.013
Vomiting	-4.139	0.811	-5.103	0.000
Pancreatitis	-3.528	1.637	-2.155	0.032
Hemorrhage	-6.468	0.916	-7.060	0.000
Perforation	-3.452	1.623	-2.126	0.034
Pulmonary infection	-3.703	1.212	-3.055	0.002
Biliary fistula	-5.773	1.184	-4.874	0.000
Acute cholangitis	-3.869	0.951	-4.067	0.000
Postoperative pain	-0.441	0.147	-2.993	0.003

SF-36, The MOS (Medical Outcomes Study) 36-Item Short Form Health Survey; ALT, alanine aminotransferase; CRP, C-reactive protein; WBC, white blood cell; SE, standard error.

Some patients have to bear the responsibility and obligation of supporting the elderly and raising children, and they have no source of income during the hospitalization, which aggravating their psychological burden. A study has shown that the care by medical and nursing staff can enhance the confidence of patients and reduce negative emotions such as fear and depression, which is important for the recovery of patients (26). Therefore, in clinical practice, practitioners need to pay attention to patients' emotional status in addition to their physical condition, encourage patients, actively give psychological comfort and emotional support, minimize treatment costs for patients with low family income on the basis of ensuring efficacy. The results of this study also found that postoperative complications such as vomiting, bleeding, biliary fistula, and pain, as well as time to first postoperative bowel evacuation and time to first postoperative flatus were also independent risk factors for negative emotions in patients. The occurrence of complications can cause patients to suffer physically and mentally after surgery, leading them to doubt the effectiveness of treatment, while the long time to recovery of intestinal function after surgery can also make patients feel uneasy. All these will aggravate the psychological burden of patients and lead to a decrease in treatment motivation, resulting in poor treatment results. Therefore, it is important to monitor the patient's indicators during the treatment process and take timely measures to prevent complications.

In addition to negative emotions, this study also found that mean diameter of CBD, mean diameter of CBDSs, ALP, CRP, WBC, and TNF- α on the first postoperative day, occurrence of vomiting, pancreatitis, bleeding, perforation, pulmonary infection, bile leak, biliary tract infection, intrahepatic cholestasis, acute cholangitis, postoperative pain, and other comorbidities, as well as time to first postoperative bowel evacuation were independent risk factors for prognosis. The prognosis of many cancers is considered to be associated with elevated levels of ALP, a hydrolase that removes phosphate groups (27-29). TNF- α is a cytokine involved in systemic inflammation that is mainly secreted directly by macrophages, and its main function is to regulate immune cells, causing apoptosis, inflammation, and autoimmunity (30). CRP and WBC are common and important indicators of inflammation. Since surgical trauma and anesthesia will stimulate the release of cytokines such as TNF- α , CRP, interleukin-6 (IL-6), and IL-8 from inflammatory cells of the body, this process is a self-injurious inflammatory response. Long-term inflammatory

stimulation places the body in a state of stress, which leads to poor prognosis of patients. Pancreatitis is recognized as the most common complication after ERCP. The possible cause of its occurrence is related to the sphincter of the papilla being incised during the procedure (31). Inadequate dissection of the sphincter during endoscopic dissection or high current during electrocoagulation for hemostasis are more likely to cause stenosis of the papillary opening, resulting in poor bile flow, which can lead to pancreatitis (32). In addition, it has been reported that the occurrence of postoperative pancreatitis is closely related to operative elapsed time, and thus a reduction in procedure duration through skilled surgical operation could lower the occurrence of pancreatitis. Hemorrhage is one of the more serious complications of ERCP and may be related to the coagulation function of the patient and the skill level of the operator. To reduce the occurrence of postoperative hemorrhage, the patient's condition should be evaluated preoperatively, with or without contraindications to ERCP, and an experienced endoscopist should be selected for the operation. If an intraoperative hemorrhage does not stop on its own, endoscopic management such as electrocoagulation for hemostasis, metal clip closure, and interventional embolization or surgical management can be performed. Perforation is a rare but serious complication of ERCP. A study has reported ERCP perforation rates of 0.08-2%, with an associated mortality rate of 3-20% (33). Intraoperative reduction of excessive incision and gentle manipulation can reduce the incidence of post-ERCP perforation. Acute cholangitis is an indication for ERCP treatment and a post-ERCP complication with an incidence of 0.5-3% (33). The occurrence of cholangitis is associated with retrograde infection of intestinal bacteria due to poor intraoperative bile drainage. Patients with combined gallbladder stones or multiple intrahepatic bile duct obstructions tend to be more prone to poor biliary drainage and cholangitis. Therefore, for those at high risk of cholangitis attacks, antibiotics can be given prophylactically before and after ERCP, along with focus on adequate intraoperative drainage.

In conclusion, the prognosis of patients with combined negative emotions can be seriously affected. For the details of the clinical work to pay attention to, through the implementation of hospital guidance, health education, psychological care and a series of nursing measures, can meet the physiological needs of patients at the same time, to meet the psychological needs of patients. In the treatment work to fully take the patient as the core, so as to improve the overall therapeutic effect. Clinicians should actively

provide psychological guidance, and improve patients' compliance with treatment to reduce the occurrence of related complications with a view to improving patients' prognosis.

The main drawbacks of this study were that there are few related type articles. And the follow-up period was relatively short due to time and manpower limitations, and the study did not include the postoperative survival of patients. It is suggested that the sample size should be expanded in future studies and the relevant discussion on survival time should be included

Conclusions

Patients with choledocholithiasis treated with ERCP are prone to anxiety, depression and other psychological disorders. Therefore, clinical work should not only focus on the patient's condition, but also pay attention to the patient's family situation and emotional changes, and give timely psychological counselling and prevent complications, reduce the patient's suffering and improve the patient's prognosis.

Acknowledgments

Funding: None.

Footnote

Reporting Checklist: The authors have completed the STROBE reporting checklist. Available at <https://gs.amegroups.com/article/view/10.21037/gc-23-150/rc>

Data Sharing Statement: Available at <https://gs.amegroups.com/article/view/10.21037/gc-23-150/dss>

Peer Review File: Available at <https://gs.amegroups.com/article/view/10.21037/gc-23-150/prf>

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at <https://gs.amegroups.com/article/view/10.21037/gc-23-150/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). The study was approved by the ethics committee of Affiliated Hospital of Jiangsu University (No. KYLC2019425) and informed consent was taken from all the patients.

Open Access Statement: This is an Open Access article distributed in accordance with the Creative Commons Attribution-NonCommercial-NoDerivs 4.0 International License (CC BY-NC-ND 4.0), which permits the non-commercial replication and distribution of the article with the strict proviso that no changes or edits are made and the original work is properly cited (including links to both the formal publication through the relevant DOI and the license). See: <https://creativecommons.org/licenses/by-nc-nd/4.0/>.

References

1. Liu L, Zhao Z, Hou X, et al. Effect of sphincter of Oddi dysfunction on the abundance of biliary microbiota (biliary microecology) in patients with common bile duct stones. *Front Cell Infect Microbiol* 2022;12:1001441.
2. European Association for the Study of the Liver (EASL). EASL Clinical Practice Guidelines on the prevention, diagnosis and treatment of gallstones. *J Hepatol* 2016;65:146-81.
3. Williams E, Beckingham I, El Sayed G, et al. Updated guideline on the management of common bile duct stones (CBDS). *Gut* 2017;66:765-82.
4. Soltan HM, Kow L, Toouli J. A simple scoring system for predicting bile duct stones in patients with cholelithiasis. *J Gastrointest Surg* 2001;5:434-7.
5. Williams EJ, Green J, Beckingham I, et al. Guidelines on the management of common bile duct stones (CBDS). *Gut* 2008;57:1004-21.
6. Baiu I, Hawn MT. Choledocholithiasis. *JAMA* 2018;320:1506.
7. Kim SS, Donahue TR. Laparoscopic Cholecystectomy. *JAMA* 2018;319:1834.
8. Parra-Membrives P, Díaz-Gómez D, Vilegas-Portero R, et al. Appropriate management of common bile duct stones: a RAND Corporation/UCLA Appropriateness Method statistical analysis. *Surg Endosc* 2010;24:1187-94.
9. Duncan CB, Riall TS. Evidence-based current surgical practice: calculous gallbladder disease. *J Gastrointest Surg* 2012;16:2011-25.
10. Manes G, Paspatis G, Aabakken L, et al. Endoscopic management of common bile duct stones: European Society of Gastrointestinal Endoscopy (ESGE) guideline.

- Endoscopy 2019;51:472-91.
11. Huang-Fu L, Qian YH, Qian MJ. The correlation between postoperative complications of ERCP and quality of life after discharge in patients with choledocholithiasis. *Ann Palliat Med* 2021;10:7794-801.
 12. Mertens MC, Roukema JA, Scholtes VP, et al. Trait anxiety predicts outcome 6 weeks after cholecystectomy. A prospective follow-up study. *Ann Behav Med* 2011;41:264-9.
 13. Oudhoff, J P., Timmermans, D R M., Knol, D L., Bijnen, A B., van der Wal, G.. Waiting for elective general surgery: impact on health related quality of life and psychosocial consequences. *BMC public health*, 2007,7:164.
 14. Ucar M, Cebicci MA, Koca I, et al. Frequency of neuropathic pain in patients with shoulder pain. *Eur Rev Med Pharmacol Sci* 2022;26:5422-5.
 15. Açma A, Carrat F, Hejblum G. Comparing SF-36 Scores Collected Through Web-Based Questionnaire Self-completions and Telephone Interviews: An Ancillary Study of the SENTIPAT Multicenter Randomized Controlled Trial. *J Med Internet Res* 2022;24:e29009.
 16. Li Y, Tan WH, Wu JC, et al. Microbiologic risk factors of recurrent choledocholithiasis post-endoscopic sphincterotomy. *World J Gastroenterol* 2022;28:1257-71.
 17. ASGE Standards of Practice Committee; Buxbaum JL, Abbas Fehmi SM, et al. ASGE guideline on the role of endoscopy in the evaluation and management of choledocholithiasis. *Gastrointest Endosc* 2019;89:1075-105.e15.
 18. Podboy A, Gaddam S, Park K, et al. Management of Difficult Choledocholithiasis. *Dig Dis Sci* 2022;67:1613-23.
 19. Pan L, Chen M, Ji L, et al. The Safety and Efficacy of Laparoscopic Common Bile Duct Exploration Combined with Cholecystectomy for the Management of Cholecysto-choledocholithiasis: An Up-to-date Meta-analysis. *Ann Surg* 2018;268:247-53.
 20. Housset C, Chrétien Y, Debray D, et al. Functions of the Gallbladder. *Compr Physiol* 2016;6:1549-77.
 21. Herrera-Ramírez MLA, López-Acevedo H, Gómez-Peña GA, et al. Efficiency of laparoscopic vs endoscopic management in cholelithiasis and choledocholithiasis. Is there any difference? *Cir Cir* 2017;85:306-11.
 22. Iqbal U, Anwar H, Khan MA, et al. Safety and Efficacy of Endoscopic Retrograde Cholangiopancreatography in Nonagenarians: A Systematic Review and Meta-Analysis. *Dig Dis Sci* 2022;67:1352-61.
 23. Gonçalves KK, Silva JI, Gomes ET, et al. Anxiety in the preoperative period of heart surgery. *Rev Bras Enferm* 2016;69:397-403.
 24. Eberhart L, Aust H, Schuster M, et al. Preoperative anxiety in adults - a cross-sectional study on specific fears and risk factors. *BMC Psychiatry* 2020;20:140.
 25. Wang FL, Gu XM, Hao BY, et al. Influence of Marital Status on the Quality of Life of Chinese Adult Patients with Epilepsy. *Chin Med J (Engl)* 2017;130:83-7.
 26. Wang D, Sun S, Hu S. The therapeutic efficacy of high-dose ambroxol and the nursing effects in the treatment of severe pneumonia. *Pak J Pharm Sci* 2019;32:1409-13.
 27. Dang C, Deng YH, Qin RY. Prognostic Value of ALP and LDH in Periapillary Carcinoma Patients Undergoing Surgery. *Curr Med Sci* 2022;42:150-8.
 28. Wei XL, Zhang DS, He MM, et al. The predictive value of alkaline phosphatase and lactate dehydrogenase for overall survival in patients with esophageal squamous cell carcinoma. *Tumour Biol* 2016;37:1879-87.
 29. Xie Y, Wei ZB, Duan XW. Prognostic value of pretreatment serum alkaline phosphatase in nasopharyngeal carcinoma. *Asian Pac J Cancer Prev* 2014;15:3547-53.
 30. Balkwill F. Tumour necrosis factor and cancer. *Nat Rev Cancer* 2009;9:361-71.
 31. Cai JS, Qiang S, Bao-Bing Y. Advances of recurrent risk factors and management of choledocholithiasis. *Scand J Gastroenterol* 2017;52:34-43.
 32. Parra-Membrives P, Martínez-Baena D, Lorente-Herce JM, et al. Choledocholithiasis recurrence following laparoscopic common bile duct exploration. *Cir Esp (Engl Ed)* 2019;97:336-42.
 33. Bray MS, Borgert AJ, Folkers ME, et al. Outcome and management of endoscopic retrograde cholangiopancreatography perforations: A community perspective. *Am J Surg* 2017;214:69-73.
- (English Language Editor: A. Muijlwijk)

Cite this article as: Li X, Zhang W, Pan Z, Shen R. Cohort analysis of relevant factors for negative emotions during the perioperative period in choledocholithiasis patients treated with ERCP and the impact on prognosis. *Gland Surg* 2023;12(5):651-663. doi: 10.21037/gS-23-150