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Analysis of Current Status and Influencing Factors of Psychological Distress Tolerance in Liver Cancer Patients after Interventional Therapy

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ABSTRACT

Background: Interventional therapy, currently, has become a major method for the clinical treatment of liver cancer patients. However, interventional therapy can also lead to various toxic side effects, and combined with the impact of the disease itself, liver cancer patients often experience more severe emotional distress. Improving individuals' levels of psychological distress tolerance may reduce sensitivity to negative life events and experiences. At this stage, there is no relevant literature reporting on the psychological distress tolerance of liver cancer patients after interventional therapy. This study investigates and analyzes psychological distress tolerance in liver cancer patients after interventional therapy, aiming to optimize personalized nursing interventions and improve patients' long-term quality of life.

Methods: This study is a cross-sectional study. Convenience sampling is adopted. Liver cancer patients who underwent interventional therapy in our hospital from August 2023 to May 2024 were selected. General Information Questionnaire, Psychological Distress Tolerance Scale, Psychological Resilience Scale, Fear of Progression Questionnaire-Short Form, and Perceived Social Support Scale were used for data collection. Multiple linear regression analysis was performed to identify the influencing factors of psychological distress tolerance in liver cancer patients after interventional therapy.

Results: The total score of psychological distress tolerance in 157 liver cancer patients was 26.88 ± 4.15, with item scores for each dimension ranging from low to high, namely, pain endurance and pain management. The results of multiple linear regression analysis showed that age, tumor size, number of tumors, psychological resilience, fear of disease progression, and perceived social support were influencing factors of psychological distress tolerance in liver cancer patients after interventional therapy ($P < .05$).

Conclusion: The level of psychological distress tolerance in liver cancer patients after interventional therapy needs to be improved, and it is relevant to age, tumor size, number of tumors, psychological resilience, fear of disease progression, and perceived social support.

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INTRODUCTION

Liver cancer, as a malignant tumor that occurs within the liver, is primarily classified as primary liver cancer or metastatic liver cancer, with hepatocellular carcinoma and cholangiocarcinoma being the most common types.[1] According to relevant statistics, liver cancer was ranked as the sixth most common cancer globally in 2018. Currently, China has the highest incidence of viral hepatitis, accounting for over 46% of liver cancer cases worldwide, and the mortality rate of liver cancer patients in China is more than twice the global average.[2] Primary Liver Cancer Diagnosis and Treatment Guidelines published by the Chinese Society of Clinical Oncology in 2022 stated that liver cancer is the fourth most common malignancy in China and the second leading cause of cancer-related deaths.[3] Due to the lack of obvious early symptoms, liver cancer patients often present at an advanced stage. For patients who are not eligible for curative surgery, interventional therapy has become the mainstay of clinical treatment, effectively inhibiting tumor progression. Common interventional procedures include transarterial

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chemoembolization (TACE) and hepatic arterial infusion chemotherapy (HAIC).[4] Numerous studies have confirmed[5,6] that the application of interventional therapy in the treatment of liver cancer patients can directly target the tumor site, locally control tumor growth and spread, effectively alleviate symptoms, improve survival rates, and have minimal trauma with rapid recovery. Patients can typically resume normal life and work within a short period. However, interventional therapy can also lead to various toxic side effects, and combined with the impact of the disease itself, liver cancer patients experience a decline in physical function and limited daily activities, often manifesting more severe emotional distress.[7] Psychological distress tolerance refers to an individual's capacity to endure psychological pain or difficulties. Individuals with lower levels of psychological distress tolerance are more susceptible to depression and anxiety. They may also perceive and evaluate stressors more sensitively, responding with excessive or inappropriate reactions.[8] Relevant studies have indicated[9] that negative life events and experiences can increase an individual's perception of psychological distress, thereby increasing the risk of suicidal ideation and avoidance behaviors. Improving an individual's level of psychological distress tolerance may reduce sensitivity to negative life events and experiences, contributing to improved mental health and quality of life. Current research on psychological distress tolerance has primarily focused on analyzing the levels among college students and adolescents,[10,11] and there is a lack of literature reporting on the psychological distress tolerance of liver cancer patients after interventional therapy. This study aims to investigate and analyze the psychological distress tolerance in liver cancer patients after interventional therapy, identify influencing factors, and provide important insights and guidance for improving the adverse psychological states of liver cancer patients after interventional therapy. This research can contribute to optimizing personalized nursing interventions and enhancing long-term quality of life for patients.

MATERIAL AND METHODS

Research Objects

In this study, 157 clinical medical liver cancer patients from the Lishui Municipal Central Hospital voluntarily participated in the survey. The study was approved by the Ethics Committee of Lishui Municipal Central Hospital (Approval Number: 2024-391). This study, as a cross-sectional one, is conducted with convenience sampling. Liver cancer patients who underwent interventional therapy in our hospital from August 2023 to May 2024 were selected. (1) Inclusion criteria: patients diagnosed with primary liver cancer through clinical and pathological examination, with an expected survival period of at least 6 months, and who have undergone interventional therapy for liver cancer. Patients should be conscious, have normal language communication, provide informed consent, and willingly participate in the study. (2) Exclusion criteria: patients with comorbid psychiatric disorders or cognitive impairments, patients participating in other similar clinical studies during the same period, patients with concomitant malignancies other than liver cancer, and patients with unstable conditions that hinder their participation in the study. All patients included in this study have signed informed consent forms, and the study has obtained approval from the hospital's Medical Ethics Committee.

MAIN POINTS

- Psychological distress tolerance in patients with liver cancer needs to be improved after interventional therapy.
- Psychological distress tolerance in liver cancer patients is associated with age and tumor characteristics.
- Psychological resilience, fear of disease progression, and perceived social support can influence the level of psychological distress tolerance in liver cancer patients.

Sample Size Calculation Method

According to the requirements for sample size in multivariable analysis, which suggest a calculation of 5-10 times the number of variables,[12] this study involves 19 variables. Considering a 20% rate of invalid questionnaires, the estimated sample size ranges from 114 to 228 cases. Taking into account hospital conditions, the final sample size is determined to be 160 cases.

RESEARCH TOOLS

General Information Questionnaire

Designed by the researchers themselves based on the study objectives, this questionnaire includes demographic information (age, gender, marital status, average monthly family income, healthcare payment method, educational level, and employment status) and disease-related data (liver function classification, cancer staging, type of interventional therapy, smoking history, alcohol consumption history, family history of liver cancer, history of hepatitis, tumor size, and number of tumors).

Psychological Distress Tolerance Scale (Tolerance for Mental Pain Scale-10)

Developed by Meerwijk et al,[13] this scale consists of 2 dimensions: pain management and pain endurance, with a total of 10 items. All items are rated on a 5-point Likert scale, where 1 = "completely disagree" and 5 = "completely agree." Items 2, 3, 5, 7, and 10 are reverse-scored, with higher total scores indicating higher psychological distress tolerance. The Cronbach's α coefficient for each dimension and the overall scale ranges from 0.82 to 0.93, and the split-half reliability ranges from 0.85 to 0.89.

Psychological Resilience Scale

This scale is a unidimensional scale consisting of 10 items. Each item is rated on a 5-point Likert scale, where 0 = "never" and 4 = "always." The total score is calculated by summing the scores of all items, with higher total scores indicating higher levels of psychological resilience. The scale has a Cronbach's α coefficient of 0.95.[14]

Fear of Progression Questionnaire-Short Form

Developed by Mehnet et al,[15] this scale consists of 2 dimensions: physical health and society and family. It includes a total of 12 items, and each item is rated on a 5-point Likert scale, where 1 = "never" and 5 = "always." The total score is obtained by summing the scores of all items, ranging from 12 to 60, with higher total scores indicating higher levels of fear. The scale has a Cronbach's α coefficient of 0.883 for the total scale.

Perceived Social Support Scale

Perceived Social Support Scale (PSSS) is a unidimensional scale consisting of 12 items. Each item is rated on a 7-point Likert scale, where 1 = "strongly disagree" and 7 = "strongly agree." The total score ranges from 12 to 84, with higher scores indicating a higher level of perceived social support by the patients. The scale has an overall Cronbach's α coefficient of 0.840.[16]

RESEARCH METHODS

Two trained and qualified investigators conducted face-to-face surveys with eligible patients in a quiet clinic room. Prior to the survey, they provided a detailed explanation of the purpose, significance, and filling method of the study to the patients, using a standardized survey guide. After obtaining the patients' consent, the investigators distributed the questionnaires for the patients to complete. If needed, the investigators provided necessary assistance. Once the questionnaires were completed, the investigators conducted an on-site inspection to ensure accuracy and then collected the questionnaires. Invalid questionnaires, for example, those with consistent or patterned responses, were excluded to ensure data accuracy and reliability.

Statistical Methods

The data are analyzed with SPSS 27.0. Normally distributed continuous variables are presented as $\bar{X} \pm s$. Independent sample *t*-tests or univariate analysis of variance is used for comparisons. Multiple linear regression analysis will be employed to identify the factors influencing psychological distress tolerance in liver cancer patients after interventional therapy. The significance level is set at $\alpha = 0.05$.

RESULTS

General Information of Research Objects

About 160 questionnaires were distributed in this study, and 157 valid questionnaires were collected, resulting in an effective response rate of 98.46%. Among the 157 liver cancer patients, there were 98 males and 59 females. The age of the participants ranged from 55 to 81 years, with a mean age of 69.45 ± 8.22 years. See Table 1 for details.

Table 1. General Information of Research Objects (n = 157)

Variable	Category	Number of Cases	Percentage (%)
Gender	Male	98	62.42
	Female	59	37.58
Age	<60 years	54	34.39
	≥60 years	103	65.61
Marital status	Married	91	57.96
	Unmarried/divorced/widowed/other	66	42.04
Monthly per capita family income	<6000 RMB	81	51.59
	≥6000 RMB	76	48.41
Medical payment type	Medical insurance or commercial insurance	115	73.25
	Self-payment	42	26.75
Educational level	Junior high school or below	114	72.61
	High school or above	43	27.39
Employment status	Employed	112	71.34
	Unemployed	45	28.66
Liver function classification	Class A	37	23.57
	Class B	42	26.75
	Class C	78	49.68
Cancer stage	Stage I	38	24.20
	Stage II	49	31.21
	Stage III	70	44.59
Interventional therapy method	TACE	133	84.71
	HAIC or other	24	15.29
Smoking history	Yes	36	22.93
	No	121	77.07
Alcohol drinking history	Yes	31	19.75
	No	126	80.25
Family history of liver cancer	Yes	91	57.96
	No	66	42.04
History of hepatitis	Yes	94	59.87
	No	63	40.13
Tumor size	<5 cm	57	36.31
	≥5 cm	100	63.69
Number of tumors	1	116	73.89
	≥2	41	26.11

Table 2. Scores of Psychological Distress Tolerance, Psychological Resilience, Fear of Disease Progression, and Perceived Social Support in Liver Cancer Patients (Points, $\bar{X} \pm s$)

Scale	Dimension	Number of Items	Score Range	Total Score	Item Average
Psychological distress tolerance	Pain management	5	5-25	11.29 ± 2.95	2.15 ± 0.41
	Pain endurance	5	5-25	15.48 ± 2.74	2.82 ± 0.36
	Total score	10	10-50	26.88 ± 4.15	2.61 ± 0.48
Psychological resilience	Total score	10	0-40	25.14 ± 6.89	2.27 ± 0.49
Fear of disease progression	Physical health	6	6-30	19.12 ± 2.15	3.12 ± 0.56
	Society & family	6	6-30	16.33 ± 2.49	2.74 ± 0.61
	Total score	12	12-60	35.56 ± 6.82	2.97 ± 0.48
Perceived social support	Total score	12	12-84	54.81 ± 8.45	4.47 ± 0.65

Scores of Psychological Distress Tolerance, Psychological Resilience, Fear of Disease Progression, and Perceived Social Support in Liver Cancer Patients

The total score for the psychological distress tolerance in liver cancer patients was 26.88 ± 4.15 points. The average scores for individual dimensions, from low to high, were pain endurance and pain management. The total score for the Psychological Resilience Scale was 25.14 ± 6.89 points. The total score for the Fear of Progression Questionnaire-Short Form (FoP-Q-SF) was 35.56 ± 6.82 points, and the total score for the PSSS was 54.81 ± 8.45 points. See Table 2 for details.

Univariate Analysis of Factors Influencing Psychological Distress Tolerance in Post-intervention Liver Cancer Patients

The results of the univariate analysis showed that there were statistically significant differences ($P < .05$) in the psychological distress tolerance scores among liver cancer patients after intervention in terms of age, tumor size, and number of tumors. See Table 3 for details.

Correlation Analysis of Psychological Distress Tolerance in Liver Cancer Patients with Psychological Resilience, Fear of Disease Progression, and Perceived Social Support Scores

The correlation analysis results showed that there was a positive correlation ($P < .001$) between psychological distress tolerance and scores of psychological resilience and perceived social support in liver cancer patients. Moreover, there was a negative correlation ($P < .001$) between psychological distress tolerance and the score of fear of disease progression. See Table 4 for details.

Multiple Linear Regression Analysis of Factors Influencing Psychological Distress Tolerance in Post-Intervention Liver Cancer Patients

Taking psychological distress tolerance in post-intervention liver cancer patients as the dependent variable, the variables with statistically significant differences in the univariate and correlation analysis were taken as independent variables. The assignment of values to the independent variables is as shown in Table 5. The results of the multiple linear regression analysis showed that age, tumor size, number of tumors, psychological resilience, fear of disease progression, and perceived social support were significant factors influencing psychological distress tolerance in post-intervention liver cancer patients ($P < .05$). These factors collectively explained 42.7% of the variance. See Table 6 for details.

DISCUSSION

The results of this study showed that the overall score of psychological distress tolerance in liver cancer patients was (26.88 ± 4.15) points, which was lower than the scores of psychological resilience in a study by Landi et al[8] on adult community residents in Italy. However, the results are consistent with findings from other studies conducted on patients with malignant tumors.[17] This indicates that the level of psychological distress tolerance in post-intervention liver cancer patients still needs improvement. The analysis of the reasons for the lower scores of psychological distress tolerance in this study may be as follows: (1) Most of the liver cancer patients in this study were in the advanced stages, with high malignancy, rapid disease progression, and high mortality rates. The disease itself is a significant traumatic event that poses a life-threatening situation and intense psychological stress, severely affecting their mental health and psychological distress tolerance.[18] (2) Interventional treatment is a novel therapeutic approach for advanced liver cancer. Patients not only have to endure the trauma of surgery, adverse reactions to chemotherapy drugs, and postoperative complications but also face the psychological pressure of living with residual tumors after interventional treatment fails to completely eradicate cancer cells, which inevitably leads to negative emotions and affects the level of psychological distress tolerance in patients.[19] Furthermore, in this study, the dimensions of the psychological distress tolerance scale for liver cancer patients were ranked from low to high as pain management and pain endurance. This suggests that liver cancer patients are more inclined to endure pain rather than actively cope with or manage it. External interventions, like cognitive

Table 3. Univariate Analysis of Factors Influencing Psychological Distress Tolerance in Post-intervention Liver Cancer Patients

Variable	Category	Number of Cases	Psychological Distress Tolerance Scores (Points, $\bar{X} \pm s$)	*t*/*F* Value	*P*
Gender	Male	98	27.14 ± 4.88	0.519	.604
	Female	59	26.72 ± 4.95		
Age	<60 years	54	24.27 ± 3.18	6.751	<.001
	≥60 years	103	29.88 ± 5.65		
Marital status	Married	91	26.92 ± 4.81	0.598	.551
	Unmarried/divorced/widowed/Other	66	26.45 ± 4.94		
Monthly per capita family income	<6000 RMB	81	26.24 ± 4.52	1.144	.254
	≥6000 RMB	76	27.08 ± 4.68		
Medical payment type	Medical insurance or commercial insurance	115	26.35 ± 4.88	0.635	.526
	Self-payment	42	26.91 ± 4.92		
Educational level	Junior high school or below	114	26.18 ± 4.04	0.972	.332
	High school or above	43	26.92 ± 4.78		
Employment status	Employed	112	26.33 ± 4.28	0.816	.416
	Unemployed	45	26.95 ± 4.37		
Liver function classification	Class A	37	26.74 ± 4.81	0.294	.746
	Class B	42	26.42 ± 4.69		
	Class C	78	26.05 ± 4.52		
Cancer stage	Stage I	38	26.98 ± 4.29	0.508	.603
	Stage II	49	26.25 ± 4.33		
	Stage III	70	26.11 ± 4.48		
Interventional therapy method	TACE	133	26.12 ± 4.88	0.772	.441
	HAIC or other	24	26.95 ± 4.65		
Smoking history	Yes	36	26.64 ± 4.45	0.337	.737
	No	121	26.92 ± 4.36		
Alcohol drinking history	Yes	31	26.41 ± 4.54	0.127	.899
	No	126	26.93 ± 4.62		
Family history of liver cancer	Yes	91	26.25 ± 4.59	0.979	.329
	No	66	26.98 ± 4.64		
History of hepatitis	Yes	94	26.32 ± 4.37	0.823	.412
	No	63	26.91 ± 4.45		
Tumor size	<5 cm	57	27.89 ± 5.12	4.867	<.001
	≥5 cm	100	24.12 ± 4.39		
Number of tumors	1	116	27.78 ± 5.89	4.683	<.001
	≥2	41	23.11 ± 4.12		

Table 4. Correlation Analysis of Psychological Distress Tolerance in Liver Cancer Patients with Psychological Resilience, Fear of Disease Progression, and Perceived Social Support Scores

Item	Psychological Distress Tolerance	
	r	*P*
Psychological resilience	0.418	<.001
Fear of disease progression	−0.327	<.001
Perceived social support	0.424	<.001

Table 5. Assignment of Variable Values

Variable	Value Assignment
Age	<60 years = 0, ≥60 years = 1
Tumor size	<5 cm = 0, ≥5 cm = 1
Number of tumors	1 tumor = 0, ≥2 tumors = 1
Psychological resilience	Original values
Fear of disease progression	Original values
Perceived social support	Original values

Table 6. Multiple Linear Regression Analysis of Factors Influencing Psychological Distress Tolerance in Post-intervention Liver Cancer Patients

Item	Partial Regression Coefficient	Standard Error	Standardized Coefficient	*t*-Value	*P*
Constant	17.155	3.092	–	6.315	<.001
Age	2.254	0.339	0.162	4.827	<.001
Tumor size	−2.226	0.184	−0.107	−2.956	.007
Number of tumors	−3.156	0.125	−0.115	−3.015	<.001
Psychological resilience	2.965	0.218	0.108	3.027	<.001
Fear of disease progression	−2.845	0.145	−0.074	−3.215	<.001
Perceived social support	3.012	0.416	0.174	5.005	<.001

R-squared = 0.464, adjusted R^2 = 0.427, F = 21.356, P < .001.

interventions, are needed to help patients alleviate pain, cultivate a positive and optimistic mindset, and improve their quality of life.

After conducting univariate and multiple linear regression analyses, the results of this study revealed that age, tumor size, number of tumors, psychological resilience, fear of disease progression, and perceived social support were the factors influencing psychological distress tolerance in post-intervention liver cancer patients, which aligns with previous research findings.[20] Wang et al also indicated a trend of younger age in the incidence and mortality peaks of liver cancer.[21] In our study population, liver cancer patients under 60 years of age accounted for 34.39%, and their scores of psychological distress tolerance were lower compared to those aged 60 or above. This could be attributed to the fact that patients in this age group are often the main pillar of their families, responsible for both their careers and serving as important financial and emotional support for their families. Losing the ability to work due to illness can impose a heavy economic burden on the family, leading to significant psychological stress. Younger individuals who are just entering the workforce and have limited life experiences may find it difficult to accept the sudden blow of illness, while older individuals who have experienced various setbacks tend to remain calm and composed, displaying stronger resilience and higher levels of psychological distress tolerance. Studies have shown that tumor size and the number of tumors are associated with tumor recurrence and patient prognosis. Typically, tumor size reflects the rate of tumor growth, and larger tumors may indicate higher TNM staging and worse prognosis. Tumor size is also an important risk factor for postoperative prognosis in liver cancer patients, as patients with tumors <5 cm have significantly lower 5-year survival rates compared to those with ≥5 cm.[22] This may explain why tumor size and number influence psychological distress tolerance in liver cancer patients. Prior researches have indicated that psychological resilience is a significant influencing factor for cancer patients' health-promoting behaviors. Patients with high psychological resilience are typically more effective in coping with postoperative pain and discomfort. They may employ more proactive coping strategies, such as seeking social support and utilizing emotion regulation techniques, to alleviate pain.[23] Patients with fear of disease progression may be more prone to experiencing negative emotions such as anxiety and depression, which can exacerbate postoperative psychological distress. Acquiring explicit social support and encouragement can help patients establish a more positive mindset and alleviate postoperative psychological distress. Additionally, social support can provide patients with relevant information and resources to help them better understand their condition and the recovery process after surgery, thereby reducing uncertainty and fear.[24,25]

There are certain limitations to this study. Firstly, it is a single-center study, which may introduce some bias in the research results. Secondly, there is currently no consensus on the assessment scale for psychological distress tolerance. In the future, more attention will be given to the relevant progress of psychological distress in liver cancer patients, and large-scale, multicenter prospective studies will be conducted to comprehensively incorporate more influencing variables and analyze the factors affecting psychological distress tolerance.

The level of psychological distress tolerance in post-intervention liver cancer patients needs improvement. It is associated with factors such factors as age, tumor size, number of tumors, psychological resilience, fear of disease progression, and perceived social support. Healthcare professionals can develop personalized intervention measures based on these influencing factors to help patients alleviate psychological distress and enhance long-term quality of life.

Data Availability Statement: The data that support the findings of this study are available on request from the corresponding author upon reasonable request.

Ethics Committee Approval: This study was approved by the Ethics Committee of Lishui Municipal Central Hospital (Approval no.: 2024-391, Date: 2024-08-23).

Informed Consent: Verbal informed consent was obtained from the patients who agreed to take part in the study.

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