

# Original Article

## Fear of disease recurrence in postoperative craniopharyngioma patients: status, influencing factors, and associations with social support and coping strategies

Yangbo Li<sup>1</sup>, Yali Zhan<sup>2</sup>, Xiaoqiang Lin<sup>1</sup>, Chengpeng Zhan<sup>1</sup>, Jiamin Liu<sup>1</sup>, Wei Liu<sup>1</sup>

<sup>1</sup>Department of Neurosurgery, The Quzhou Affiliated Hospital of Wenzhou Medical University, Quzhou People's Hospital, Quzhou 324000, Zhejiang, China; <sup>2</sup>Department of Urology, The Quzhou Affiliated Hospital of Wenzhou Medical University, Quzhou People's Hospital, Quzhou 324000, Zhejiang, China

Received April 3, 2026; Accepted July 14, 2026; Epub August 15, 2026; Published August 30, 2026

**Abstract:** This prospective observational study aimed to investigate the status of social support and fear of cancer recurrence (FCR), as well as the influencing factors, in patients after craniopharyngioma surgery. A total of 168 postoperative craniopharyngioma patients were enrolled using questionnaire survey, including general data questionnaire, Social Support Rating Scale (SSRS), Fear of Progression Questionnaire Short Form (FoP-Q-SF), and Medical Coping Modes Questionnaire (MCMQ). The mean FCR score was  $39.54 \pm 8.65$ , and 71.43% (120/168) of patients had clinically significant FCR (score  $\geq 34$ ). Univariate analysis showed that FCR was associated with education level, employment status, family history of tumors, symptom distress, personality traits, and chronic comorbidities ( $P < 0.05$ ). Multiple linear regression indicated that education level ( $\beta = -1.126$ ,  $P < 0.001$ ), symptom distress ( $\beta = -2.661$ ,  $P = 0.021$ ), personality orientation ( $\beta = 3.153$ ,  $P < 0.001$ ), and resignation coping strategy ( $\beta = 1.042$ ,  $P < 0.001$ ) were independent predictors of FCR. FCR is prevalent in patients with postoperative craniopharyngioma and is independently affected by education level, symptom distress, personality traits, and negative coping strategies. Targeted psychological interventions should be provided to improve mental health and prognosis.

**Keywords:** Craniopharyngioma, social support, coping strategies, fear of cancer recurrence

### Introduction

Craniopharyngioma (CP) is a histologically benign neoplasm (WHO grade I), which often exhibits invasive growth. It usually invades the suprasellar or intrasellar region, or protruding into the third ventricle, typically requiring surgical interventions [1-3]. Although tumor resection can be successfully achieved and patients' life quality can be much improved, the risk of recurrence after surgery remains to be a major source of anxiety for both patients and clinicians. If a craniopharyngioma recurs, patients may face surgery, radiation therapy, or chemotherapy, which bring psychological and lifestyle distress [4-6].

During the rehabilitation phase following tumor resection, patients often suffer from fear

of cancer recurrence (FCR) [7-9]. This fear stems not only from concerns about tumor progression, but can also be triggered by the physical impacts of surgical intervention, treatment sequelae, and factors associated with postoperative follow-up [10]. To date, studies focusing on FCR in postoperative craniopharyngioma patients are limited, and the prevalence, severity, and related influencing factors remain unclear. Clarifying the level of FCR and its association with social support and coping strategies is of great clinical significance for developing psychological intervention programs, alleviating negative emotions, and improving long-term prognosis.

This study is the first to systematically evaluate FCR, social support, and coping strategies in postoperative craniopharyngioma patients, and

explore their independent influencing factors. The findings will fill the research gap and provide evidence for clinical psychological care.

### Materials and methods

#### *Patient characteristics*

This is a prospective observational study conducted at The Quzhou Affiliated Hospital of Wenzhou Medical University. The study period was from December 2021 to December 2024. All data were collected anonymously from medical records and questionnaire surveys. This study was approved by the Medical Ethics Committee of The Quzhou Affiliated Hospital of Wenzhou Medical University. All data were collected anonymously in compliance with the Declaration of Helsinki.

Inclusion criteria: (1) Age over 18; (2) Histopathologically confirmed as craniopharyngioma; (3) Underwent surgical resection; (4) Complete clinical and follow-up data; (5) Awareness of diagnosis and able to cooperate with investigation; (6) Signed informed consent; (7) Sufficient cognitive function and literacy to complete the questionnaires.

Exclusion criteria: (1) Other malignant tumors or severe organ dysfunction; (2) Significant impairment in cognitive function; (3) Visual, hearing, or language disorders that prevent participation in the investigation; (4) Refused to participate or incomplete data.

#### *Sample size*

Sample size was estimated as 10 times the number of variables (12 variables, requiring a minimum of 120 participants). With 20% loss to follow-up, target sample size was 144. A total of 176 patients were screened, 8 were excluded due to incomplete data, and 168 valid cases were included, with an effective rate of 95.45%.

#### *General information*

Age, gender, marital status, education, family income, employment, tumor family history, symptom distress, personality, comorbidities, etc.

#### *Assessment scales*

(1) Revised Fear of Progression Questionnaire Short Form (FoP-Q-SF): The FoP-Q-SF was first developed by Mehnert et al. [11] to measure anxiety and fear in patients with chronic diseases requiring long-term medication, such as hypertension. It was later adapted for use in cancer populations. This 12-item questionnaire demonstrated a Cronbach's  $\alpha$  coefficient of 0.87. It employs a 5-point Likert scale ranging from 1 (never) to 5 (always), with a total score range of 12 to 60. A higher score indicated a more severe fear-related psychological state. Subsequently, this scale was modified and tailored for the Chinese population, retaining all the 12 items. A total score  $\geq 34$  is defined as clinically significant. This revised version yields a Cronbach's  $\alpha$  coefficient of 0.883 [12].

(2) Social Support Rating Scale (SSRS): Comprising 10 items altogether, the SSRS [13] encompasses three dimensions: objective support, subjective support, and utilization of support. Objective support represents the support individuals receive in their actual existence, including both material and emotional support. Subjective support pertains to the favorable psychological experiences individuals encounter in social environments, represented by respect and understanding afforded by the community. Utilization of support denotes the individual's utilization rate of diverse external support forms. The SSRS provides a better understanding of individuals' social support status, thereby supporting their social adaptation and enhancing their physical and mental health. Scored between 12 and 66, the scale's total score is positively correlated with the degree of social support and the scale has a Cronbach's  $\alpha$  coefficient of 0.856.

(3) Medical Coping Modes Questionnaire (MCMQ): The MCMQ was initially developed for application in cancer patients, surgical conditions, chronic hepatitis, and gynecological disorders, as coping strategies vary according to disease type and stage. Comprising 20 items altogether, the Chinese version of the MCMQ is classified into three dimensions: coping, avoidance, and surrender. The items are rated on a 4-point Likert scale, and specific items (Items 1, 4, 9, 10, 12, 13, 18 and 19) require reverse scoring [14]. The Cronbach's  $\alpha$  coefficient

cients for the three dimensions are 0.69, 0.60 and 0.76, respectively.

### *Outcome measures*

Primary outcome: Level of FCR and its independent influencing factors.

Secondary outcomes: Status of social support and coping strategies; correlation between social support, coping strategies, and FCR.

Assessment time point: All scales were assessed at 3-6 months after discharge from postoperative hospital stay.

FCR: Defined as persistent psychological anxiety and worry about the recurrence or progression of craniopharyngioma after surgical treatment, assessed by the revised FoP-Q-SF.

Social support: Refers to the objective material support, subjective emotional care, and utilization of support resources obtained by patients from family, friends, and social networks, measured by the SSRS.

Coping strategies: Reflect cognitive and behavioral responses adopted by patients to deal with disease-related stress, including facing, avoidance, and surrender dimensions, evaluated by the MCMQ.

### *Statistical methods*

Data were entered and verified by two individuals using Epidata 3.1, while statistical analysis were performed using SPSS 25.0. In the descriptive analysis, frequencies and percentages were used for categorical variables, while continuous variables were presented as the mean  $\pm$  standard deviation or median [M (P25-P75)] according to data normality. We conducted independent sample t-tests to compare FCR scores between groups with different baseline characteristics, while for multiple-group comparisons, we used one-way analysis of variance (with the Brown-Forsythe test for unequal variances). Furthermore, pairwise comparisons between multiple groups were performed using the Student-Newman-Keuls test. Bivariate correlation analysis was used to evaluate the relationships among the dimensions of MCMQ, SSRS, and FoP-Q-SF. Univariate linear regression was used to screen factors associated with coping strategy scores and FCR scores. Relevant parameters, includ-

ing  $\beta$ , SE, t, P and  $R^2$ , were calculated for each variable. Multiple linear regression analysis was performed to identify independent predictors of FCR (primary outcome), social support, and coping strategy scores. The dependent variables were continuous scale scores. Independent variables included sociodemographic characteristics, symptom distress, personality traits, and coping dimensions. Categorical predictors were dummy-coded (reference groups specified in tables). Collinearity was assessed by variance inflation factor (VIF); VIF<2.0 indicated no significant collinearity. Stepwise regression was used with entry criteria  $P<0.05$  and removal criteria  $P>0.10$ . Model fit was evaluated by  $R^2$ , adjusted  $R^2$ , and F-test. All tests were two-tailed, with  $P<0.05$  considered statistically significant.

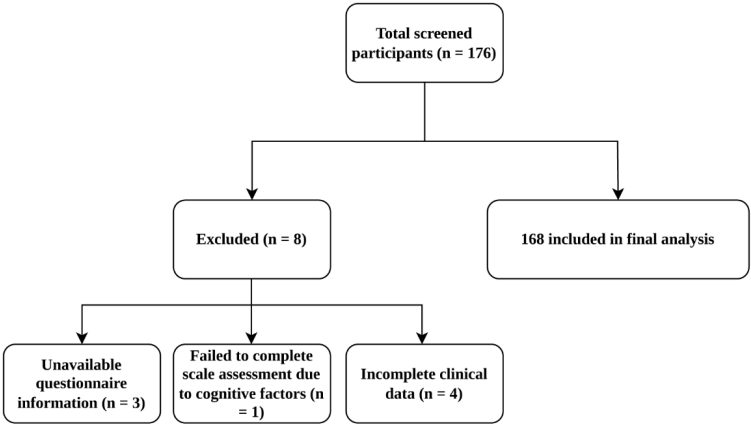
## **Results**

### *General information of the study participants*

A total of 176 postoperative craniopharyngioma patients were screened during the study period. Among them, 8 patients were excluded due to incomplete clinical data, missing questionnaire information and cognitive impairment that hindered scale completion. Ultimately, 168 eligible patients were enrolled in the present study (**Figure 1**), yielding an effective inclusion rate of 95.45%. The cohort consisted of 87 males (51.79%) and 81 females (48.21%). Their ages ranged from 18 to 88 years, and the dominant age categories were 45-59 years and 60-74 years, accounting for 41.07% and 46.43% of the sample, respectively. Most patients were retired (48.81%), and a positive personality orientation was predominant, accounting for 91.07%. Detailed information on the general characteristics can be found in **Table 1**.

### *Social support of postoperative craniopharyngioma patients*

(1) Comparison of Social Support Scores (SSS): The results of the univariate analysis showed that SSS of postoperative craniopharyngioma patients varied significantly by sex, age, number of children, smoking history, education level, family income, employment status, tumor family history, and personality orientation ( $P<0.05$ ). However, no significant differences were detected in symptom distress, payment



**Figure 1.** A total of 176 postoperative craniopharyngioma patients were initially screened between January 2020 and December 2023. Eight patients were excluded for incomplete clinical data, missing questionnaire information and inability to finish scale assessment. A total of 168 eligible patients were included for final analysis, with an effective response rate of 95.45%.

method, or chronic comorbidities ( $P>0.05$ ), as detailed in **Table 2**.

(2) Factors influencing SSS: To identify the independent influencing factors of social support, we used a multiple linear regression model with the social support scores of postoperative craniopharyngioma individuals as the dependent variable and sociodemographic characteristics (such as gender and age) as the independent variables (values provided in **Table 3**). Stepwise regression was performed (with entry criterion  $\alpha = 0.05$  and removal criterion  $\beta = 0.10$ ), and the results identified education level and family income as independent influencing factors for social support among postoperative craniopharyngioma patients (**Table 4**).

*Coping strategies of postoperative craniopharyngioma patients*

(1) Comparison of coping strategy scores: Univariate analysis revealed significant differences in coping strategy scores among postoperative craniopharyngioma patients with respect to age, family income, employment status, symptom distress, and personality orientation ( $P<0.05$ ). However, no significant differences were observed in gender, number of children, education level, tumor family history, payment method, comorbidity with chronic diseases, or smoking history ( $P>0.05$ ). Detailed comparisons of coping strategy scores among differ-

ent sociodemographic characteristics are demonstrated in **Table 5**.

(2) Univariate linear regression analysis for coping strategy scores: Univariate linear regression analysis was further conducted to explore the association between each indicator and coping strategy scores. The results confirmed that age, household income, employment status, symptom distress and personality traits were significantly correlated with coping strategy scores (all  $P<0.05$ ). In contrast, gender, fertility status, smoking history, education level, family history of tumor, medical pay-

ment method and chronic comorbidities showed no significant linear relationship with coping strategy scores (all  $P>0.05$ ). Detailed parameters, including the unstandardized regression coefficient ( $\beta$ ), standard error (SE), t-value, P-value, and coefficient of determination ( $R^2$ ), are presented in **Table 6**.

(3) Factors influencing coping strategy scores: Using coping strategy scores of postoperative craniopharyngioma patients as the dependent variable and sociodemographic characteristics (e.g., personality orientation and age) as the independent variables (values given in **Table 7**), a multiple linear regression model was applied to identify the independent influencing factors of coping strategy. Stepwise regression (with an entry criterion  $\alpha = 0.05$  and a removal criterion  $\beta = 0.10$ ) identified employment status, symptom distress, and income substantially as independent influencing factors for coping strategy scores (**Table 8**).

*Investigation on FCR*

A total of 168 individuals participated in this study, with 87 males (51.79%) and 81 females (48.21%), and a mean age of  $57.53\pm 7.93$  years. Postoperative craniopharyngioma patients had an average FCR score of  $39.54\pm 8.65$ . Of these, 120 cases (71.43%) scored  $\geq 34$ , which is considered clinically significant. The average total score for social support was  $41.35\pm 6.38$ , while the mean scores for subjec-

# Social support and fear of recurrence in postoperative craniopharyngioma

**Table 1.** Demographic data (n = 168)

| Characteristics                                           | Number of cases | %     |
|-----------------------------------------------------------|-----------------|-------|
| Gender                                                    |                 |       |
| Male                                                      | 87              | 51.79 |
| Female                                                    | 81              | 48.21 |
| Age                                                       |                 |       |
| 18-44                                                     | 14              | 8.33  |
| 45-59                                                     | 69              | 41.07 |
| 60-74                                                     | 78              | 46.43 |
| 75-88                                                     | 7               | 4.17  |
| Fertility status                                          |                 |       |
| No children                                               | 10              | 5.95  |
| 1 child                                                   | 51              | 30.36 |
| 2 children                                                | 82              | 48.81 |
| 3 or more children                                        | 25              | 14.88 |
| Smoking history                                           |                 |       |
| Yes                                                       | 88              | 52.38 |
| No                                                        | 80              | 47.62 |
| Education                                                 |                 |       |
| Primary school and below                                  | 52              | 30.95 |
| Junior high school                                        | 56              | 33.33 |
| High school or technical secondary school                 | 32              | 19.05 |
| Bachelor degree or college degree or above                | 28              | 16.67 |
| Household per capita income (yuan/month)                  |                 |       |
| ≤2000                                                     | 49              | 29.17 |
| 2001-3000                                                 | 52              | 30.95 |
| 3001-5000                                                 | 43              | 25.60 |
| >5000                                                     | 24              | 14.29 |
| Working status                                            |                 |       |
| Retired                                                   | 82              | 48.81 |
| Sick leave                                                | 41              | 24.40 |
| Working                                                   | 45              | 26.79 |
| Family history of cancer                                  |                 |       |
| Yes                                                       | 26              | 15.48 |
| No                                                        | 142             | 84.52 |
| Symptom distress                                          |                 |       |
| Yes                                                       | 53              | 31.55 |
| No                                                        | 115             | 68.45 |
| Personality tendencies                                    |                 |       |
| Positive                                                  | 153             | 91.07 |
| Negative                                                  | 15              | 8.93  |
| Payment method                                            |                 |       |
| Basic medical insurance for urban employees and residents | 84              | 50.00 |
| New Rural Cooperative Medical Insurance                   | 76              | 45.24 |
| At one's own expense                                      | 8               | 4.76  |
| Chronic diseases                                          |                 |       |
| Yes                                                       | 62              | 36.90 |
| No                                                        | 106             | 63.10 |

# Social support and fear of recurrence in postoperative craniopharyngioma

**Table 2.** Comparison of social support scores by sociodemographic characteristics

| Characteristics                                           | Social support ( $\bar{x} \pm s$ ) | t/F    | P      |
|-----------------------------------------------------------|------------------------------------|--------|--------|
| Gender                                                    |                                    | -2.631 | 0.012  |
| Male                                                      | 40.17±6.42                         |        |        |
| Female                                                    | 42.49±6.11                         |        |        |
| Age                                                       |                                    | 8.351  | <0.001 |
| 18-44                                                     | 44.47±7.88                         |        |        |
| 45-59                                                     | 41.89±5.59                         |        |        |
| 60-74                                                     | 39.51±5.67                         |        |        |
| 75-88                                                     | 36.60±5.42                         |        |        |
| Fertility status                                          |                                    | 3.130  | 0.001  |
| No children                                               | 37.78±6.58                         |        |        |
| 1 child                                                   | 43.37±6.73                         |        |        |
| 2 children                                                | 41.23±5.75                         |        |        |
| 3 or more children                                        | 40.11±6.26                         |        |        |
| Smoking history                                           |                                    | 2.165  | 0.021  |
| Yes                                                       | 39.83±6.36                         |        |        |
| No                                                        | 42.27±6.31                         |        |        |
| Education                                                 |                                    | 5.532  | <0.001 |
| Primary school and below                                  | 39.38±5.52                         |        |        |
| Junior high school                                        | 42.27±5.24                         |        |        |
| High school or technical secondary school                 | 40.85±7.68                         |        |        |
| Bachelor degree or college degree or above                | 44.12±7.76                         |        |        |
| Household income                                          |                                    | 3.237  | 0.013  |
| ≤2000                                                     | 39.54±5.12                         |        |        |
| 2001-3000                                                 | 41.21±6.62                         |        |        |
| 3001-5000                                                 | 43.72±6.63                         |        |        |
| >5000                                                     | 42.30±6.74                         |        |        |
| Working status                                            |                                    | 5.234  | 0.009  |
| Retired                                                   | 40.12±5.47                         |        |        |
| Sick leave                                                | 40.85±6.38                         |        |        |
| Working                                                   | 43.61±7.08                         |        |        |
| Family history of cancer                                  |                                    | 2.125  | 0.023  |
| Yes                                                       | 43.65±7.04                         |        |        |
| No                                                        | 40.83±6.16                         |        |        |
| Symptom distress                                          |                                    | 0.872  | 0.576  |
| Yes                                                       | 41.24±5.17                         |        |        |
| No                                                        | 41.35±6.84                         |        |        |
| Personality tendencies                                    |                                    | -4.275 | <0.001 |
| Positive                                                  | 41.75±6.03                         |        |        |
| Negative                                                  | 37.23±6.06                         |        |        |
| Payment method                                            |                                    | 0.784  | 0.722  |
| Basic medical insurance for urban employees and residents | 41.84±7.12                         |        |        |
| New Rural Cooperative Medical Insurance                   | 40.63±5.58                         |        |        |
| At one's own expense                                      | 40.33±3.94                         |        |        |
| Chronic diseases                                          |                                    | 1.251  | 0.124  |
| Yes                                                       | 40.35±6.63                         |        |        |
| No                                                        | 41.81±6.24                         |        |        |



## Social support and fear of recurrence in postoperative craniopharyngioma

**Table 3.** Multiple linear stepwise regression analysis assignments

| Variables                | Assignments                                                                                                                                        |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| Gender                   | 1 = Male, 2 = Female                                                                                                                               |
| Age                      | 1 = 18-44, 2 = 45-59, 3 = 60-74, 4 = 75-88                                                                                                         |
| Fertility status         | 1 = No children, 2 = 1 child, 3 = 2 children, 4 = 3 or more children                                                                               |
| Smoking history          | 1 = Yes, 2 = No                                                                                                                                    |
| Education                | 1 = primary school and below, 2 = junior high school, 3 = senior high school or technical secondary school, 4 = undergraduate or college and above |
| Working status           | 1 = retired, 2 = sick off, 3 = working                                                                                                             |
| Family history of cancer | 1 = Yes, 2 = No                                                                                                                                    |
| Household income         | 1 = ≤2000, 2 = 2001-3000, 3 = 3001-5000, 4 = ≥5001                                                                                                 |
| Personality tendencies   | 1 = positive, 2 = negative                                                                                                                         |

**Table 4.** Multiple linear regression analysis of factors affecting SSS

| Independent Variables | $\beta$                                                            | $\beta_{\text{stand}}$ | SE    | t     | P     | 95% CI       | VIF   |
|-----------------------|--------------------------------------------------------------------|------------------------|-------|-------|-------|--------------|-------|
| Education             | 1.040                                                              | 0.228                  | 0.734 | 2.643 | 0.012 | 0.182, 1.898 | 1.032 |
| Household income      | 0.975                                                              | 0.205                  | 0.547 | 2.337 | 0.025 | 0.127, 2.082 | 1.032 |
| Model statistics      | $R^2 = 0.112$ , Adjusted $R^2 = 0.101$ , $F = 9.456$ , $P < 0.001$ |                        |       |       |       |              |       |

**Table 5.** Comparison of coping strategy scores by sociodemographic characteristics

| Characteristics                            | Coping strategies ( $\bar{x} \pm s$ ) | t/F    | P     |
|--------------------------------------------|---------------------------------------|--------|-------|
| Gender                                     |                                       | 0.754  | 0.548 |
| Male                                       | 41.29±5.14                            |        |       |
| Female                                     | 41.47±5.04                            |        |       |
| Age                                        |                                       | 3.893  | 0.014 |
| 18-44                                      | 42.91±5.42                            |        |       |
| 45-59                                      | 41.38±5.28                            |        |       |
| 60-74                                      | 39.81±4.22                            |        |       |
| 75-88                                      | 41.71±1.89                            |        |       |
| Fertility status                           |                                       | 0.585  | 0.744 |
| No children                                | 40.81±5.12                            |        |       |
| 1 child                                    | 41.72±5.43                            |        |       |
| 2 children                                 | 40.95±4.98                            |        |       |
| 3 or more children                         | 40.84±4.92                            |        |       |
| Smoking history                            |                                       | -0.286 | 0.635 |
| Yes                                        | 41.42±4.74                            |        |       |
| No                                         | 41.03±4.88                            |        |       |
| Education                                  |                                       | 1.782  | 0.145 |
| Primary school and below                   | 40.47±5.13                            |        |       |
| Junior high school                         | 40.75±4.53                            |        |       |
| High school or technical secondary school  | 41.73±5.07                            |        |       |
| Bachelor degree or college degree or above | 42.27±5.18                            |        |       |
| Household income                           |                                       | 5.574  | 0.001 |
| ≤2000                                      | 39.47±3.92                            |        |       |
| 2001-3000                                  | 40.74±5.53                            |        |       |
| 3001-5000                                  | 42.53±3.99                            |        |       |
| >5000                                      | 43.64±5.25                            |        |       |

## Social support and fear of recurrence in postoperative craniopharyngioma

|                                                           |            |        |        |
|-----------------------------------------------------------|------------|--------|--------|
| Working status                                            |            | 9.376  | <0.001 |
| Retired                                                   | 39.87±3.84 |        |        |
| Sick leave                                                | 40.55±4.74 |        |        |
| Working                                                   | 43.53±5.85 |        |        |
| Family history of cancer                                  |            | 0.882  | 0.652  |
| Yes                                                       | 42.12±4.94 |        |        |
| No                                                        | 41.41±4.83 |        |        |
| Symptom distress                                          |            | 3.593  | 0.013  |
| Yes                                                       | 43.86±5.62 |        |        |
| No                                                        | 39.86±4.63 |        |        |
| Personality tendencies                                    |            | -2.398 | 0.038  |
| Positive                                                  | 40.92±4.84 |        |        |
| Negative                                                  | 43.31±5.14 |        |        |
| Payment method                                            |            | 1.363  | 0.127  |
| Basic medical insurance for urban employees and residents | 41.14±4.92 |        |        |
| New Rural Cooperative Medical Insurance                   | 40.66±5.17 |        |        |
| At one's own expense                                      | 39.71±4.23 |        |        |
| Chronic diseases                                          |            | -1.826 | 0.083  |
| Yes                                                       | 40.73±4.67 |        |        |
| No                                                        | 41.61±5.08 |        |        |

**Table 6.** Univariate linear regression analysis of factors associated with coping strategy scores (n = 168)

| Variables               | β      | SE    | t      | P      | R <sup>2</sup> |
|-------------------------|--------|-------|--------|--------|----------------|
| Gender                  | 0.178  | 0.326 | 0.546  | 0.585  | 0.002          |
| Age                     | -0.625 | 0.298 | -2.097 | 0.037  | 0.026          |
| Fertility status        | 0.113  | 0.301 | 0.375  | 0.708  | 0.001          |
| Smoking history         | -0.195 | 0.312 | -0.625 | 0.533  | 0.002          |
| Education               | 0.426  | 0.315 | 1.352  | 0.178  | 0.011          |
| Household income        | 0.782  | 0.304 | 2.572  | 0.011  | 0.038          |
| Working status          | 1.264  | 0.337 | 3.751  | <0.001 | 0.077          |
| Family history of tumor | 0.351  | 0.329 | 1.067  | 0.287  | 0.007          |
| Symptom distress        | 1.125  | 0.318 | 3.538  | <0.001 | 0.069          |
| Personality tendencies  | 1.018  | 0.342 | 2.977  | 0.003  | 0.049          |
| Payment method          | -0.287 | 0.321 | -0.894 | 0.372  | 0.005          |
| Chronic diseases        | -0.412 | 0.316 | -1.304 | 0.194  | 0.01           |

**Table 7.** Multiple linear stepwise regression analysis assignment

| Variables              | Assignments                                        |
|------------------------|----------------------------------------------------|
| Working status         | 1 = retired, 2 = sick off, 3 = working             |
| Household income       | 1 = ≤2000, 2 = 2001-3000, 3 = 4001-5000, 4 = ≥5000 |
| Personality tendencies | 1 = positive, 2 = negative                         |
| Age                    | 1 = 18-44, 2 = 45-59, 3 = 60-74, 4 = 75-88         |
| Symptom distress       | 1 = Yes, 2 = No                                    |

tive support, objective support, and utilization of support were 25.64±3.85, 9.28±2.24, and 6.45±2.07, separately. Regarding coping strat-

egies, the scores for facing, avoidance, and surrender were 16.57±3.33, 16.85±2.78, and 7.72±2.84, in that order.



**Table 8.** Multiple linear regression analysis of factors affecting coping strategy scores

| Independent Variables       | $\beta$                                                             | $\beta_{\text{stand}}$ | SE    | t     | P     | 95% CI       | VIF   |
|-----------------------------|---------------------------------------------------------------------|------------------------|-------|-------|-------|--------------|-------|
| Working status (vs Retired) |                                                                     |                        |       |       |       |              |       |
| Working                     | 1.389                                                               | 0.241                  | 0.616 | 3.219 | 0.003 | 0.436, 2.342 | 1.187 |
| Household income            | 0.832                                                               | 0.189                  | 0.367 | 2.213 | 0.027 | 0.086, 1.578 | 1.045 |
| Symptom distress            | 0.796                                                               | 0.175                  | 0.268 | 2.140 | 0.025 | 0.248, 1.365 | 1.089 |
| Model statistics            | $R^2 = 0.187$ , Adjusted $R^2 = 0.172$ , $F = 12.358$ , $P < 0.001$ |                        |       |       |       |              |       |

#### Univariate analysis of patient's FCR

Results from univariate analysis indicated that FCR scores among postoperative craniopharyngioma patients varied significantly by education level, employment status, family history of tumors, symptom distress, personality orientation, and the presence of chronic diseases ( $P < 0.05$ ). Nonetheless, no notable differences were identified for number of children, family income, gender, payment method, and others ( $P > 0.05$ ) (Table 9).

Univariate linear regression analysis was performed to verify the linear effects of all variables on FCR scores. The results indicated that education level, employment status, family history of tumor, symptom distress, personality tendencies and chronic comorbidities were significant influencing factors of FCR scores (all  $P < 0.05$ ). No significant linear correlation was observed between gender, age, fertility status, smoking history, household income, payment method and FCR scores (all  $P > 0.05$ ). All statistical indicators are summarized in Table 10.

#### Correlation of coping strategies, SSS, and FCR

Due to non-conformity with the bivariate normal distribution, Spearman correlation analysis was employed to examine the relationship between coping strategies (facing, avoidance, surrender), the dimensions of the social support scale, and the FCR. Figure 2 visualizes the pairwise correlations among FCR, social support, and coping strategies, and provides direct evidence for the subsequent regression analysis. The results of the Spearman correlation analysis demonstrated a positive correlation between FCR and surrender ( $r_s = 0.896$ ,  $P < 0.001$ ), whereas correlations between FCR and social support or other coping dimensions were weak or non-significant (Figure 2). This result supports the main conclusion that surrender coping is the key psychological factor independently associated with higher FCR.

#### Factors influencing FCR

Using FCR scores of postoperative craniopharyngioma patients as the dependent variable and sociodemographic characteristics (such as education level, employment status) as the independent variables (Table 11), a multiple linear regression model was applied to identify the independent influencing factors. After stepwise regression (with an entry level of  $\alpha = 0.05$  and a removal level of  $\beta = 0.10$ ).

Multiple linear regression analysis was performed to identify independent predictors of FCR. After adjusting for confounding variables, stepwise regression revealed that lower education level, severe symptom distress, negative personality orientation, and higher surrender coping scores were independent risk factors for increased FCR (all  $P < 0.05$ ). The final model showed good fit ( $R^2 = 0.356$ , adjusted  $R^2 = 0.338$ ,  $F = 21.745$ ,  $P < 0.001$ ), with no significant collinearity (all  $VIF < 2.0$ ) (Table 12).

#### Discussion

##### Analysis of the FCR in postoperative craniopharyngioma individuals

Craniopharyngioma is a common intracranial tumor, and surgical treatment is its primary therapeutic approach [15-17]. Our results are consistent with prior findings in other cancer populations, confirming that FCR is a prevalent psychological issue among postoperative tumor patients [18, 19]. Compared with the 16.7% incidence of FCR in bladder cancer patients reported by Hinz et al. [20] and the 36% incidence in breast cancer survivors reported by Song et al. [21], the FCR rate (71.43%) in our craniopharyngioma patients was higher. This difference may be explained by the unique clinical characteristics of craniopharyngioma: it is a slow-growing but invasive tumor with a high postoperative recurrence rate (up to 30-50%), and patients often experi-

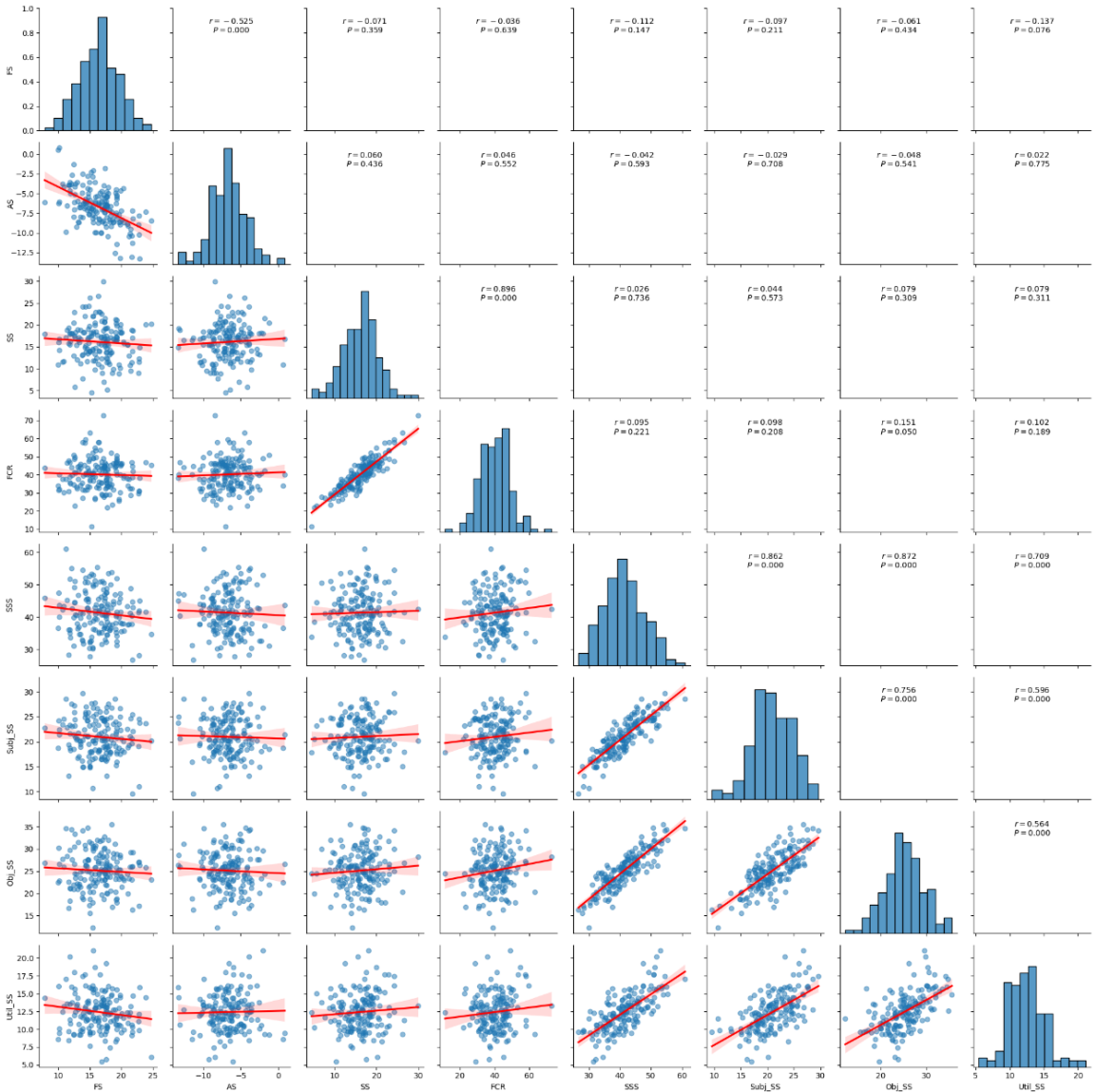
# Social support and fear of recurrence in postoperative craniopharyngioma

**Table 9.** Comparison of fear of cancer recurrence scores by sociodemographic

| Characteristics                                           | FCR ( $\bar{x} \pm s$ ) | t/F    | P      |
|-----------------------------------------------------------|-------------------------|--------|--------|
| Gender                                                    |                         | -1.384 | 0.150  |
| Male                                                      | 38.76±8.77              |        |        |
| Female                                                    | 40.16±8.44              |        |        |
| Age                                                       |                         | 0.422  | 0.726  |
| 18-44                                                     | 40.33±6.58              |        |        |
| 45-59                                                     | 39.63±9.48              |        |        |
| 60-74                                                     | 39.14±7.42              |        |        |
| 75-88                                                     | 38.77±7.21              |        |        |
| Fertility status                                          |                         | 0.823  | 0.329  |
| No children                                               | 39.26±6.82              |        |        |
| 1 child                                                   | 40.11±8.52              |        |        |
| 2 children                                                | 39.35±9.24              |        |        |
| 3 or more children                                        | 39.68±8.07              |        |        |
| Smoking history                                           |                         | 1.251  | 0.872  |
| Yes                                                       | 38.76±8.89              |        |        |
| No                                                        | 40.03±8.21              |        |        |
| Education                                                 |                         | 3.296  | 0.032  |
| Primary school and below                                  | 47.27±9.82              |        |        |
| Junior high school                                        | 38.80±8.28              |        |        |
| High school or technical secondary school                 | 38.32±6.92              |        |        |
| Bachelor degree or college degree or above                | 36.02±6.65              |        |        |
| Household income                                          |                         | 0.981  | 0.072  |
| ≤2000                                                     | 38.23±7.04              |        |        |
| 2001-3000                                                 | 40.17±9.48              |        |        |
| 3001-5000                                                 | 39.78±9.15              |        |        |
| >5000                                                     | 41.32±8.43              |        |        |
| Working status                                            |                         | 5.394  | <0.001 |
| Retired                                                   | 36.68±8.04              |        |        |
| Sick leave                                                | 39.57±9.27              |        |        |
| Working                                                   | 45.08±6.65              |        |        |
| Family history of cancer                                  |                         | -6.834 | <0.001 |
| Yes                                                       | 36.57±7.08              |        |        |
| No                                                        | 45.71±8.84              |        |        |
| Symptom distress                                          |                         | 4.788  | <0.001 |
| Yes                                                       | 32.67±8.34              |        |        |
| No                                                        | 38.28±8.45              |        |        |
| Personality tendencies                                    |                         | -5.395 | <0.001 |
| Positive                                                  | 38.87±8.12              |        |        |
| Negative                                                  | 47.65±8.29              |        |        |
| Payment method                                            |                         | 1.023  | 0.762  |
| Basic medical insurance for urban employees and residents | 40.42±9.38              |        |        |
| New Rural Cooperative Medical Insurance                   | 38.34±7.45              |        |        |
| At one's own expense                                      | 42.17±7.97              |        |        |
| Chronic diseases                                          |                         | 2.374  | 0.042  |
| Yes                                                       | 37.82±6.54              |        |        |
| No                                                        | 40.37±9.22              |        |        |

**Table 10.** Univariate linear regression analysis of factors associated with FCR scores (n = 168)

| Variables               | $\beta$ | SE    | t      | P      | R <sup>2</sup> |
|-------------------------|---------|-------|--------|--------|----------------|
| Gender                  | 1.392   | 0.987 | 1.41   | 0.16   | 0.012          |
| Age                     | -0.215  | 0.954 | -0.225 | 0.822  | 0              |
| Fertility status        | 0.327   | 0.941 | 0.347  | 0.729  | 0.001          |
| Smoking history         | 1.274   | 0.962 | 1.324  | 0.187  | 0.01           |
| Education               | -2.875  | 0.876 | -3.282 | <0.001 | 0.062          |
| Household income        | 0.963   | 0.925 | 1.041  | 0.299  | 0.006          |
| Working status          | 3.152   | 0.893 | 3.53   | <0.001 | 0.069          |
| Family history of tumor | 2.987   | 0.881 | 3.39   | <0.001 | 0.065          |
| Symptom distress        | 2.741   | 0.867 | 3.161  | 0.002  | 0.057          |
| Personality tendencies  | 4.126   | 0.914 | 4.514  | <0.001 | 0.109          |
| Payment method          | 0.452   | 0.936 | 0.483  | 0.63   | 0.001          |
| Chronic diseases        | 1.983   | 0.905 | 2.191  | 0.03   | 0.028          |



**Figure 2.** Correlation analysis between three coping strategies, scores of each dimension of social support scale and FCR. FS: facing scores, AS: avoidance scores, SS: surrender scores, FCR: Fear of Cancer Recurrence, SSS: Social Support Scores, Subj\_SS: Subjective Support Scores, Obj\_SS: Objective Support Scores, Util\_SS: Support Utilization Scores.

**Table 11.** Multiple linear stepwise regression analysis assignment

| Variables                | Assignments                                                                                                                                        |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| Education                | 1 = primary school and below, 2 = junior high school, 3 = senior high school or technical secondary school, 4 = undergraduate or college and above |
| Working status           | 1 = retired, 2 = sick off, 3 = working                                                                                                             |
| Family history of cancer | 1 = Yes, 2 = No                                                                                                                                    |
| Symptom distress         | 1 = Yes, 2 = No                                                                                                                                    |
| Chronic diseases         | 1 = Yes, 2 = No                                                                                                                                    |
| Personality tendencies   | 1 = positive, 2 = negative                                                                                                                         |
| Surrender coping         | Continuous score                                                                                                                                   |

**Table 12.** Multivariate linear regression analysis of factors affecting patients' FCR scores

| Independent Variables  | $\beta$                                                             | $\beta_{stand}$ | SE    | t      | P      | 95% CI         | VIF   |
|------------------------|---------------------------------------------------------------------|-----------------|-------|--------|--------|----------------|-------|
| Education              | -1.126                                                              | -0.198          | 1.527 | -3.288 | <0.001 | -1.566, -0.122 | 1.054 |
| Symptom distress       | -2.661                                                              | -0.245          | 1.255 | -2.317 | 0.021  | -4.674, -0.358 | 1.098 |
| Personality tendencies | 3.153                                                               | 0.287           | 1.867 | 4.281  | <0.001 | 1.337, 6.011   | 1.132 |
| Surrender coping       | 1.042                                                               | 0.452           | 0.203 | 5.292  | <0.001 | 0.821, 1.624   | 1.076 |
| Model statistics       | $R^2 = 0.356$ , Adjusted $R^2 = 0.338$ , $F = 21.745$ , $P < 0.001$ |                 |       |        |        |                |       |

ence persistent postoperative complications such as endocrine disorders, visual impairment, and hypothalamic dysfunction. These long-term physical burdens and poor prognosis expectations lead to significantly higher psychological distress and FCR than other common cancers. Additionally, the Chinese cultural context, where patients tend to suppress negative emotions and lack systematic psychological intervention, further exacerbates FCR, which aligns with the findings of Lu et al. [21] in Chinese breast cancer patients. Our study's consistent trend with international and domestic research supports the validity and generalizability of our results.

In conclusion, the incidence of FCR is relatively high among patients after craniopharyngioma resection, and it may be influenced by multiple factors. This suggests that greater attention and support should be paid to the mental health of this population. Healthcare professionals should deliver targeted psychological guidance and encourage patients to release their negative emotions, while involving their family members in psychological management to help patients confront the disease more positively and adhere better to treatment.

*Analysis of factors influencing FCR in postoperative craniopharyngioma individuals*

A variety of factors are involved in the occurrence and severity of FCR in postoperative craniopharyngioma patients. According to the study results, factors such as education level, symptom distress, personality orientation, and resignation coping strategies were identified as independent influencing factors for FCR among these patients.

In multifactorial analysis, education level was confirmed as an independent factor influencing social support, further reflecting the relationship between patient's sociocultural status and FCR. A study found that individuals with a higher education level tend to approach problems in a more mature manner and are rational in their responses to the various challenges related to the diagnosis, treatment, and care of their illness [22]. Interestingly, a study on nasopharyngeal cancer patients undergoing radiation therapy found that higher educational levels were associated with greater FCR, contrasting with the conclusions drawn in this study [23]. The discrepancy in the relationship between educational level and FCR across

studies reflects disease-specific and cultural differences in health literacy and psychological perception. For nasopharyngeal cancer, higher education enables patients to access more information about severe treatment toxicities and poor prognosis, increasing anxiety. In contrast, craniopharyngioma patients with lower education often lack accurate understanding of recurrence risk and postoperative care, leading to excessive worry driven by uncertainty. Higher education in this study was linked to better access to medical resources, clearer understanding of treatment plans, and more rational coping with the disease, thus reducing FCR. This mechanism highlights that the impact of education on FCR is not fixed but depends on disease type, information accessibility, and patients' health beliefs.

Symptom distress usually stems from the cancer itself and side effects of cancer therapy. For postoperative craniopharyngioma patients, this burden is particularly prominent. The severity of symptom distress exacerbates the severity of the manifested symptoms and the interference with daily life [23, 24]. This could be attributed to substantial postoperative physical distress, distress, which leads to higher levels of anxiety and depression. Limited knowledge about the effects of craniopharyngioma treatment intensifies patients' psychological burden, significantly influencing their FCR. Our study corroborates the findings of Savard J [25], which indicated that even minor changes in symptoms could increase distress levels among individuals experiencing severe symptom distress.

Diverse personality characteristics often result in varying behavioral responses to external stimuli, especially in social environments. Our results revealed that patients with a negative personality orientation exhibited higher FCR scores following postoperative craniopharyngioma, possibly due to their tendency toward introversion, social withdrawal, a preference for solitude, pessimism in adverse situations, and poor adaptability to external pressures, which can lead to the onset of negative emotions [26, 27]. Positive personality traits enable individuals to adopt active coping strategies when facing crises, thereby promoting their health level, whereas individuals with negative personality traits tend to respond passively or

avoidantly, making them more vulnerable to physical and psychological disorders and impairing their overall health [28]. Those with positive and optimistic personality trait possess adequate self-regulation capabilities when facing illness, employing correct coping strategies to deal with the stressful event of being ill, and making full use of available social support to facilitate recovery. It is clear that personality traits are an important determinant of FCR, necessitating healthcare professionals to offer targeted psychological counseling and guidance for individuals with unfavorable personality traits to alleviate the FCR and enhance patients' life quality.

Coping strategies are defined as the cognitive and behavioral responses individuals adopt when confronting various pressures and setbacks. Individuals tend to employ either positive or negative coping strategies when encountering various circumstances. Resignation as a coping strategy is generally regarded as a negative way to manage illness. Patients with a passive attitude toward their illness are typically reluctant to adhere to clinicians' medical instructions or accept necessary care measures. Moreover, they hesitate to maintain active communication with medical staff and lack a comprehensive understanding of their own disease, which results in the deterioration of their mental health [29, 30]. The underlying reason is that once diagnosed with craniopharyngioma, patients often lose hope of returning to a normal life, leading them to experience a particularly long recovery period involving the dual suffering of physical and mental distress, resulting in unstable emotions and the adoption of a resigned coping strategy. According to a study conducted in Shanghai, China, breast cancer patients who adopted active coping strategies exhibited enhanced psychological resilience and improved quality of life [31]. Different coping strategies in response to stress can exert distinct effects, and the passive coping strategy of resignation significantly affects disease progression. The use of resignation coping strategies in response to illness may result in the inhibition or non-expression of negative emotions, ultimately intensifying patients' FCR. Clinical staff should assess patients' specific situations as thoroughly as possible to help them identify sources of stress, adapt to their health status, and implement

effective strategies to address potential psychological issues. For health professionals, it is vital to support postoperative craniopharyngioma patients in building satisfactory interpersonal relationships, coordinate with their family members to understand patient needs, mitigating fear during role transition, and providing positive psychological support.

### *Innovations*

This study innovatively focuses on the psychological effects experienced by patients with craniopharyngioma after surgery, which fills the gap in relevant research areas. This study conducted a comprehensive multivariate analysis to explore the associations between social support, coping styles, sociodemographic characteristics, and FCR among patients, providing important theoretical and practical references for future psychological intervention and support programs.

### *Limitations*

This study has several limitations that should be acknowledged.

(1) Single-center and regional sample bias. The participants were recruited from a single tertiary hospital in eastern China, with a relatively homogeneous demographic and clinical background. The findings may not be fully generalizable to craniopharyngioma patients in other regions, especially those from rural areas or different cultural backgrounds, where access to medical resources and psychological support may differ significantly.

(2) Cross-sectional design limitation. This study only collected data at a single time point (3-6 months postoperatively), which can only reveal correlations rather than causal relationships between FCR and influencing factors. FCR is a dynamic psychological state that may change over time with disease progression, treatment outcomes, or social support changes. Longitudinal follow-up studies are needed to track the trajectory of FCR and confirm the causal effects of the identified factors.

(3) Measurement limitations. This study relied on self-reported questionnaires, which are subject to response bias (e.g., social desirability bias). In addition, we only focused on FCR,

social support, and coping strategies, and did not include other potential psychological factors such as anxiety, depression, or quality of life, which may interact with FCR and influence the results.

(4) Lack of objective clinical indicators. We did not collect objective data such as tumor recurrence status, endocrine function, or imaging results, which may be important confounders of FCR. Future studies should integrate both subjective psychological scales and objective clinical indicators to comprehensively explore FCR-related factors.

Despite these limitations, this study is the first to systematically investigate FCR in postoperative craniopharyngioma patients, providing valuable preliminary evidence for this understudied area. The results lay a foundation for future multi-center, longitudinal studies and the development of targeted psychological interventions.

### **Conclusion**

Postoperative craniopharyngioma patients have a high level of FCR, which is independently influenced by education level, symptom distress, personality traits, and resignation coping strategies. Clinicians should strengthen psychological assessment and provide personalized interventions to reduce FCR and improve quality of life.

### **Disclosure of conflict of interest**

None.

**Address correspondence to:** Wei Liu, Department of Neurosurgery, The Quzhou Affiliated Hospital of Wenzhou Medical University, Quzhou People's Hospital, Room 302, Unit 1, Building 3, Zhongliang Wangfu, Shuanggang Subdistrict, Kecheng District, Quzhou 324000, Zhejiang, China. Tel: +86-0570-3125086; E-mail: lw20080833@126.com

### **References**

- [1] Müller HL, Merchant TE, Warmuth-Metz M, Martinez-Barbera JP and Puget S. Craniopharyngioma. *Nat Rev Dis Primers* 2019; 5: 75.
- [2] Salmon MK, Kshirsagar RS and Eide JG. Craniopharyngioma surgery for rhinologists. *Curr Opin Otolaryngol Head Neck Surg* 2023; 31: 45-52.



- [3] Piloni M, Gagliardi F, Bailo M, Losa M, Boari N, Spina A and Mortini P. Craniopharyngioma in pediatrics and adults. *Adv Exp Med Biol* 2023; 1405: 299-329.
- [4] Zheng Y, Ong SH, Vellayappan B and Nga VDW. Management of first recurrence or progression of craniopharyngioma after resection alone: a systematic review and individual-participant data meta-analysis. *J Clin Neurosci* 2023; 118: 123-131.
- [5] Renfrow JJ, Greeneway GP, Carter L and Couture DE. Intraventricular recurrence of a craniopharyngioma: case report. *J Neurosurg Pediatr* 2018; 22: 393-396.
- [6] Ma J, Chen T, Zhang J, Cao W, Gao G, Yu X and Wang H. Enhanced outcomes in residual or recurrent craniopharyngioma: evaluating combined gamma knife and phosphorus-32 brachytherapy. *Clin Transl Oncol* 2024; 26: 2198-2204.
- [7] Yang X, Li Y, Lin J, Zheng J, Xiao H, Chen W and Huang F. Fear of recurrence in postoperative lung cancer patients: trajectories, influencing factors and impacts on quality of life. *J Clin Nurs* 2024; 33: 1409-1420.
- [8] Gu LS, Lee LY and Huang HY. Post-cancer treatment-related symptom distress and fear of cancer recurrence in colorectal cancer survivors. *Hu Li Za Zhi* 2024; 71: 52-63.
- [9] Van De Wal M, Van Oort I, Schouten J, Thewes B, Gielissen M and Prins J. Fear of cancer recurrence in prostate cancer survivors. *Acta Oncol* 2016; 55: 821-827.
- [10] Sharpe L, Curran L, Butow P and Thewes B. Fear of cancer recurrence and death anxiety. *Psychooncology* 2018; 27: 2559-2565.
- [11] Mehnert A, Herschbach P, Berg P, Henrich G and Koch U. Fear of progression in breast cancer patients-validation of the short form of the Fear of Progression Questionnaire (FoP-Q-SF). *Z Psychosom Med Psychother* 2006; 52: 274-288.
- [12] Cheng HL, Li MC and Leung DYP. Psychometric testing of the traditional Chinese version of the fear of progression questionnaire-short form in cancer survivors. *J Nurs Meas* 2022; 30: 707-720.
- [13] Shen Z, Ding S, Shi S and Zhong Z. Association between social support and medication literacy in older adults with hypertension. *Front Public Health* 2022; 10: 987526.
- [14] Hong Y, Yuhua L, Youhui G, Zhanying W, Shili Z, Xiaoting H and Wenhua Y. Death anxiety among advanced cancer patients: a cross-sectional survey. *Support Care Cancer* 2022; 30: 3531-3539.
- [15] Buchfelder M, Schlaffer SM, Lin F and Kleindienst A. Surgery for craniopharyngioma. *Pituitary* 2013; 16: 18-25.
- [16] Laurent C, Gaillard S and Baussart B. Expanded endoscopic endonasal approach for the resection of midline craniopharyngiomas with hypothalamic involvement. *Acta Neurochir (Wien)* 2022; 164: 3291-3296.
- [17] Kageji T, Miyamoto T, Kotani Y, Kaji T, Bando Y, Mizobuchi Y, Nakajima K and Nagahiro S. Congenital craniopharyngioma treated by radical surgery: case report and review of the literature. *Childs Nerv Syst* 2017; 33: 357-362.
- [18] Schapira L, Zheng Y, Gelber SI, Poorvu P, Ruddy KJ, Tamimi RM, Peppercorn J, Come SE, Borges VF, Partridge AH and Rosenberg SM. Trajectories of fear of cancer recurrence in young breast cancer survivors. *Cancer* 2022; 128: 335-343.
- [19] Simonelli LE, Siegel SD and Duffy NM. Fear of cancer recurrence: a theoretical review and its relevance for clinical presentation and management. *Psychooncology* 2017; 26: 1444-1454.
- [20] Hinz A, Mehnert A, Ernst J, Herschbach P and Schulte T. Fear of progression in patients 6 months after cancer rehabilitation-a validation study of the fear of progression questionnaire FoP-Q-12. *Support Care Cancer* 2015; 23: 1579-1587.
- [21] Lu Q, Liu Q, Fang S, Ma Y, Zhang B, Li Ha and Song L. Relationship between fear of progression and symptom burden, disease factors and social/family factors in patients with stage-IV breast cancer in Shandong, China. *Cancer Med* 2024; 13: e6749.
- [22] Özdemir Ü and Tokaç Akdeniz A. Pain beliefs of cancer patients and associated factors. *Agri* 2023; 35: 244-253.
- [23] Zheng M, Wang S, Zhu Y and Wan H. Trajectories of fear of progression in nasopharyngeal carcinoma patients receiving proton and heavy ion therapy. *Support Care Cancer* 2023; 31: 630.
- [24] Cunningham SJ, Patton M, Schulte F, Richardson PA and Heathcote LC. Worry about somatic symptoms as a sign of cancer recurrence: prevalence and associations with fear of recurrence and quality of life in survivors of childhood cancer. *Psychooncology* 2021; 30: 1077-1085.
- [25] Savard J and Ivers H. The evolution of fear of cancer recurrence during the cancer care trajectory and its relationship with cancer characteristics. *J Psychosom Res* 2013; 74: 354-360.
- [26] Eley DS, Leung J, Hong BA, Cloninger KM and Cloninger CR. Identifying the dominant personality profiles in medical students: implications for their well-being and resilience. *PLoS One* 2016; 11: e0160028.
- [27] Klimenko AV, Pertsov SS and Yakovenko IY. Correlation Connections between individual-

- and-typological features, indices of performance of goal-directed activity, and heart rate variability parameters. *Bull Exp Biol Med* 2019; 167: 599-602.
- [28] Zhang X, Sun D, Qin N, Liu M, Jiang N and Li X. Factors correlated with fear of cancer recurrence in cancer survivors: a meta-analysis. *Cancer Nurs* 2022; 45: 406-415.
- [29] Sastrawan S, Newton JM and Malik G. Nurses' integrity and coping strategies: an integrative review. *J Clin Nurs* 2019; 28: 733-744.
- [30] Heffer T and Willoughby T. A count of coping strategies: a longitudinal study investigating an alternative method to understanding coping and adjustment. *PLoS One* 2017; 12: e0186057.
- [31] Hu RY, Wang JY, Chen WL, Zhao J, Shao CH, Wang JW, Wei XM and Yu JM. Stress, coping strategies and expectations among breast cancer survivors in China: a qualitative study. *BMC Psychol* 2021; 9: 26.