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ORIGINAL RESEARCH

Latent Profile Analysis of Flourishing in Patients Undergoing Chemotherapy After Ovarian Cancer Surgery: A Single-Center Study in Shanxi

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Purpose: To explore the categories of flourishing in patients undergoing postoperative chemotherapy for ovarian cancer and analyse the influencing factors for each category.

Patients and Methods: A cross-sectional survey was conducted with 260 patients who underwent postoperative chemotherapy at the gynaecological oncology ward of a tertiary hospital in Shanxi Province between May 2024 and May 2025. Participants completed the General Information Questionnaire, Flourishing Scale, Learned Helplessness Scale, Index of Autonomous Functioning Scale, and Perceived Social Support Scale. Latent profile analysis (LPA) was used to identify the flourishing profiles. Subsequently, univariate and multivariate logistic regression analyses were conducted to examine the factors associated with profile membership.

Results: Among the 237 patients who completed valid questionnaires (recovery rate: 91.2%), the mean age was 59.48 ± 9.70 years. The LPA revealed three distinct latent categories of flourishing: low flourishing group (38.1%, n = 90), moderate flourishing group (34.2%, n = 80), and high flourishing group (27.7%, n = 67). Illness duration, comorbidity burden, learned helplessness, autonomous functioning, and perceived social support were significant factors influencing latent flourishing profiles ($P<0.05$).

Conclusion: Significant heterogeneity exists in flourishing levels among patients with ovarian cancer undergoing postoperative chemotherapy. Healthcare professionals can tailor interventions based on these distinct flourishing profiles and their key characteristics. This approach aims to promote patient flourishing, thereby improving their quality of life.

Keywords: flourishing, latent profile analysis, self-determination, helplessness, learned, autonomous functioning, social support

Introduction

Ovarian cancer (OC) is one of the most common gynaecological cancers and is challenging to detect at an early stage.[1] In recent years, the global incidence of ovarian cancer has increased annually, accompanied by a trend toward diagnosis at younger ages.[2] Within this global context, China accounts for 15.45% of ovarian cancer cases and 14.66% of related mortality.[3] Current ovarian cancer treatments involve multimodal therapies, including surgery, chemotherapy, immunotherapy, and targeted therapy, with approximately 97% of patients requiring postoperative chemotherapy.[4,5] Although these treatments extend patient survival, the long-term treatment burden often causes negative emotions, such as anxiety and depression, which can harm mental health and quality of life.[6,7] Mental health includes the absence of mental illness and positive psychological functioning. The concept of flourishing has gained prominence in positive psychology, representing a state of optimal mental health characterised by positive emotions and robust psychological and social functioning.[8] Interventions aimed at fostering flourishing improve the well-being and quality of life of patients with cancer.[9] Recent research has focused primarily on patients with thyroid cancer, breast cancer, and head and neck cancer.[10–12] These studies demonstrate that flourishing significantly affects the psychological health of patients with cancer. Notably, while latent profile analysis has been applied to explore variations in flourishing levels in breast cancer populations,[11] the flourishing status of patients with ovarian cancer, particularly through the theoretical lens of Self-Determination Theory, remains

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unexamined. This represents a critical gap, as patients with ovarian cancer face substantially more severe clinical challenges than those with breast or thyroid cancer, including difficulty in detecting early symptoms, diagnosis at an advanced stage in approximately 75% of patients, and a lower 5-year survival rate, all of which may contribute to a uniquely elevated risk of psychological distress and distinct flourishing profiles.[13] Our research addresses this gap by being the first to conduct a latent profile analysis of flourishing specifically among postoperative ovarian cancer patients, using Self-determination theory as the lens to interpret these clinically grounded profiles. A comprehensive assessment of the psychological well-being of patients with OCs should focus on reducing distress and encouraging positive states.[14] Historically, the emphasis has been primarily on alleviating distress; our focus on flourishing aims to balance this view. Studying flourishing does not seek to replace the important task of reducing suffering but complements it by addressing a broader aspect of the human experience with cancer. This is particularly crucial in ovarian cancer, in which the chronic nature of the disease makes striving for positive functioning vital to long-term survival.

Self-determination theory (SDT) offers a comprehensive framework for examining psychological flourishing.[15] It conceptualises human behavioural motivation along a continuum of autonomous choices, suggesting that motivation increases when three basic psychological needs are met: autonomy, competence, and relatedness.[16] Furthermore, the expression of these three basic needs is influenced by sociocultural context. In Shanxi, factors such as family expectations and access to support services are likely to shape how patients experience autonomy, competence, and relatedness, thereby affecting their overall ability to thrive. To explore the heterogeneity of flourishing among patients with ovarian cancer, this study used latent profile analysis based on SDT. We explored the impact of three core needs, autonomy (measured by the Index of Autonomous Functioning), competence (assessed through learned helplessness), and relatedness (indicated by perceived social support), on the well-being of patients undergoing postoperative chemotherapy. This approach aims to establish a scientific foundation for developing targeted clinical interventions that promote the flourishing of this vulnerable population.

Objects and Methods

Study Population

This cross-sectional study employed convenience sampling to recruit participants from the gynaecological oncology ward of a tertiary hospital in Shanxi Province between May 2024 and May 2025. The participants were patients with ovarian cancer who received postoperative chemotherapy. The inclusion criteria were as follows: (1) age 18 years or older, (2) a confirmed diagnosis of ovarian cancer via pathology, (3) currently undergoing postoperative chemotherapy, (4) good communication skills, verbal expression, and literacy, and (5) willingness to provide informed consent. The exclusion criteria were as follows: (1) other malignancies, severe heart or kidney disease, or autoimmune conditions; (2) severe psychological or psychiatric disorders; and (3) cognitive impairment. The sample size was calculated using Kendall's method, which recommends 5–10 times the number of independent variables.[17] With 20 variables in this study, the initial target was 100–200 participants. Considering an expected dropout rate of 20%, the minimum sample size was planned to be 120–240.

Survey Tools

General Information Questionnaire

Based on a review of the literature, the research team created a two-part questionnaire. The first part collected general personal information, including age, current residence, family income per capita, marital status, and education level. The second part gathered information about the disease, such as the number of chemotherapy sessions, length of illness, number of comorbidities, and tumor stage.

Flourishing Scale (FS)

Developed by Diener et al[18] in 2010 and translated into Chinese by Lai Qiaozhen,[19] this scale comprises eight dimensions: meaning, self-acceptance, interpersonal relationships, helping others, commitment, self-efficacy, optimism about the future, and respect from others. Responses are recorded on a 7-point Likert scale ranging from "strongly disagree" to "strongly agree", with total scores ranging from 8 to 56. Higher scores indicate greater levels of Flourishing. In this study, the scale demonstrated a Cronbach's α coefficient of 0.846.

Learned Helplessness Scale (LHS)

Developed by Joy et al[20] and translated into Chinese by Yan Sisi et al,[21] this 19-item scale assesses three dimensions: locus of causality (internal-external), stability (stable-unstable), and globality (general-specific). Responses are recorded on a 4-point Likert scale (1 = "strongly disagree" to 4 = "strongly agree"), yielding total scores ranging from 19 to 76. Higher scores indicate stronger learned helplessness. In this study, the scale demonstrated a Cronbach's α coefficient of 0.858.

Index of Autonomous Functioning (IAF)

Developed by Weinstein et al[22] and translated into Chinese by Wang Jiayu et al,[23] this 15-item instrument measures three dimensions: self-congruence, interest-taking, and susceptibility to control. Items use a 5-point Likert scale (1 = "completely untrue" to 5 = "completely true"), with the interest-taking subscale reverse-scored. Total scores range from 15 to 75, where higher scores reflect greater autonomy. Cronbach's α was 0.891 in this study.

Perceived Social Support Scale (PSSS)

The PSSS was compiled by Zimet et al[24] in 1987 and translated into Chinese by Jiang Qianjin.[25] It includes three dimensions: family support, friend support, and other support, with a total of 12 items. Scoring is based on a 7-point Likert scale, ranging from "strongly disagree" to "strongly agree", with scores ranging from 1 to 7, respectively. The total score ranges from 12 to 48 points, with higher scores indicating better perceived social support. In this study, the Cronbach's α coefficient for this scale was 0.853.

Data Collection and Quality Control

The researchers explained the study purpose, questionnaire completion requirements, and confidentiality protocols to patients with OC undergoing postoperative chemotherapy and their family members before administering the questionnaire. After obtaining informed consent, researchers uniformly trained in the study procedures distributed paper questionnaires to the participants. A key part of our protocol was the immediate on-site verification of each completed questionnaire. Researchers addressed questions in real time during completion and conducted a thorough check for missing or unclear responses immediately after collection, requesting prompt supplementation from participants. This proactive approach successfully prevented missing data, resulting in a complete dataset for analysis.

Statistical Methods

This study used Mplus 8.3 software to perform latent profile analysis and evaluate the model fit of 1 to 5 profiles. Model fit was assessed using the Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), and adjusted Bayesian Information Criterion (aBIC), with smaller values indicating a better fit. Classification accuracy was measured with information entropy (Entropy), where values closer to 1 reflect higher accuracy. Differences in model fit were compared using the Lo-Mendell-Rubin likelihood ratio test (LMRT) and the Bootstrap likelihood ratio test (BLRT). If $P < 0.05$, it suggests that the k-category model is better than the k-1-category model. Statistical analysis was performed using SPSS 27.0 software. For normally distributed quantitative data, the mean ± standard deviation was reported, and intergroup comparisons were conducted with one-way analysis of variance. Qualitative data were described using frequencies and proportions, with intergroup comparisons performed via the χ^2 test. Additionally, multivariate logistic regression analysis was utilized to identify factors influencing postoperative chemotherapy patients with ovarian cancer across different categories. All statistical analyses were considered statistically significant at $P < 0.05$.

Results

General Information on Patients Undergoing Postoperative Chemotherapy for Ovarian Cancer

A total of 260 questionnaires were distributed in this survey, and 237 were ultimately returned, resulting in an effective response rate of 91.15%. The general information on the 237 patients undergoing postoperative chemotherapy for ovarian cancer is shown in Table 1.

Table 1 General Information on 237 Patients Who Underwent Postoperative Chemotherapy for Ovarian Cancer

Sports Event	Frequency (n)	Composition Ratio (%)
(a person's) age		
<60 years	115	48.5
>60 years	122	51.5
Place of residence		
Village	140	59.1
City	97	40.9
Per capita monthly household income		
<2000RMB	107	45.1
2000~4000 RMB	101	42.6
>4000RMB	29	12.2
Marital status		
Spouse	176	74.3
Single	61	25.7
Educational level		
Junior high school and below	118	49.8
High school/vocational high school	71	30.0
College and above	48	20.3
Body Mass Index (BMI)		
<18.5 kg/m^2	109	46.0
18.5≤BMI<24.0kg/m^2	95	40.1
≥24 kg/m^2	33	13.9
Number of chemotherapy sessions		
<3 times	60	25.3
3-6 times	45	19.0
>6 times	132	55.7
Duration of illness		
3-6 months	75	31.6
7-12 months	85	35.9
>12 months	77	32.5
Number of comorbidities		
<2 types	89	37.6
≥2 types	148	62.4
Tumour Staging		

(*Continued*)

Table 1 (Continued).

Sports Event	Frequency (n)	Composition Ratio (%)
Stage I ~ Stage II	75	31.6
Stage III ~ Stage IV	162	68.4

Note: RMB: Chinese Yuan (CNY).

Scale Scores for Postoperative Chemotherapy Patients

The mean scores for each scale were as follows: Flourishing Scale (FS): Total score = 28.86 ± 7.91. Learned Helplessness Scale (LHS): Total = 45.67 ± 8.73; Internal-External = 16.94 ± 3.78; Stable-Unstable = 19.00 ± 4.00; Global-Specific = 9.73 ± 2.31. Index of Autonomous Functioning (IAF): Total = 39.30 ± 10.11; Self-Congruence = 13.41 ± 4.08; Interest-Taking = 13.19 ± 4.09; Susceptibility to Control = 12.70 ± 4.18; Perceived Social Support Scale (PSSS): Total = 44.83 ± 8.71; Family Support = 14.60 ± 3.74; Friend Support = 14.57 ± 4.01; Other Support = 15.65 ± 3.96.

Results of Latent Profile Analysis for Flourishing in Patients Undergoing Postoperative Chemotherapy for Ovarian Cancer

1. Models 1 to 5 of the latent profile analysis were sequentially fitted using the eight items of the Flourishing Scale as manifest variables. The results of model fitting are presented in Table 2. As the number of profiles increased, AIC, BIC, and aBIC values steadily decreased. The LMRT and BLRT tests for model 3 were significant ($P < 0.05$), indicating a good fit, while the LMRT values for models with more than three profiles were not significant ($P > 0.05$). Additionally, the entropy values for these models were lower than those for model 3. The final selection of Model 3 was based on a comprehensive evaluation that combined statistical data, clinical interpretability, and practical relevance. This choice was primarily influenced by two factors: First, Model 3 was chosen because it struck a better balance between statistical accuracy and clinical significance. It exhibited a superior fit to the data compared to the two-profile model, as shown by lower AIC, BIC, and aBIC scores. Importantly, this statistical advantage had clinical relevance: Model 3 successfully identified a distinct 'Moderate flourishing 'subgroup, a key target for prevention—something the two-profile model could not achieve. Second, although Models 4 and 5 had lower AIC and aBIC values, they did not demonstrate a significant improvement in model fit, as evidenced by non-significant LMRT results. These models yielded less clear and more fragmented subgroups, offering little meaningful insight or clinical value beyond Model 3. Therefore, Model 3 was selected for providing an optimal balance of statistical robustness,

Table 2 Potential Profile Analysis of Flourishing in 237 Patients Undergoing Postoperative Chemotherapy for Ovarian Cancer

Category	1	2	3	4	5
AIC	6741.826	6272.403	6126.329	6093.488	6064.089
BIC	6797.315	6359.105	6244.243	6242.615	6244.429
aBIC	6746.600	6279.864	6136.475	6106.320	6079.607
LMRT(P)	–	0.0250	<0.05	0.2092	0.6873
BLRT(P)	–	<0.05	<0.05	<0.05	<0.05
Entropy	–	0.851	0.851	0.835	0.827
Categorical probability	–	0.473/0.527	0.277/0.342/0.381	0.195/0.206/0.286/0.313	0.075/0.174/20,228/0.248/0.275

Abbreviations: AIC, Akaike Information Criterion; BIC, Bayesian Information Criterion; aBIC, Adjusted Bayesian Information Criterion; Entropy, Entropy; LMR, Log-Mendeleev-Rutabaga Likelihood Ratio Test; BLRT, Bootstrap-based Likelihood Ratio Test; -, Blank item.

clarity, and practical utility. Furthermore, this model exhibited high classification accuracy, with entropy and average latent class probabilities for the most likely class exceeding 0.90, indicating highly reliable profile assignments. Based on the classification from the latent profile analysis, the scores of the three categories on each item of flourishing were plotted (see Figure 1). Category 1: A total of 90 cases (38.1%). The scores of patients undergoing postoperative chemotherapy for ovarian cancer in category 1 were low, so it was named the "low flourishing group." Category 2: A total of 80 cases (34.2%), whose scores fell between those of categories 1 and 3, so it was named the "moderate flourishing group." Category 3: A total of 67 cases (27.7%) showed high Flourishing, so it was named the "high flourishing group." It's important to emphasize that this profile classification was not based on fixed cutoff points. Instead, using a model-driven, person-centered approach, latent profile analysis identifies subgroups directly from response patterns across all items, with probabilistic assignment offering an objective and data-driven result.

2. The scores for FS, LHS, IAF, and PSSS were reported. The total FS score averaged 28.86 ± 7.91 points. The total LHS score was 45.67 ± 8.73, including specific dimensions such as an internal-external score of 16.94 ± 3.78, a stable-unstable score of 19.00 ± 4.00, and a universal-specific score of 9.73 ± 2.31. The total IAF score was 39.30 ± 10.11, with sub-scores of 13.41 ± 4.08 for self-consistency, 13.19 ± 4.09 for contemplative interest, and 12.70 ± 4.18 for controllability. The total PSSS score was 44.83 ± 8.71. The scores for the subscales were as follows: 14.60 ± 3.74 for family support, 14.57 ± 4.01 for friend support, and 15.65 ± 3.96 for other support. Refer to Table 1 for general information on 237 patients undergoing postoperative chemotherapy for ovarian cancer.

Univariate Analysis of Latent Profile Categories

Univariate analysis revealed no statistically significant differences among the three latent profile groups of postoperative ovarian cancer chemotherapy patients in terms of age, residence, average monthly household income per capita, marital status, number of chemotherapy cycles, or tumor stage ($p > 0.05$). Nevertheless, significant differences between groups were observed in education level, body mass index (BMI), illness duration, and comorbidity burden ($p < 0.05$). Refer to Table 3.

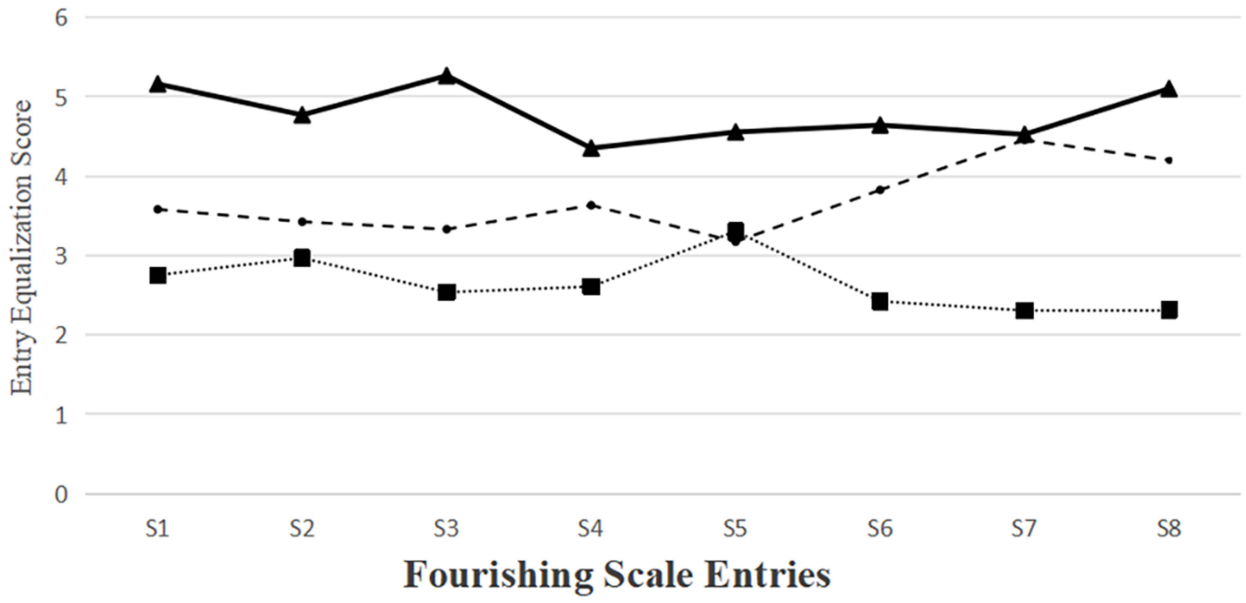

Figure 1 Entry Equalization Score across Flourishing Scale Entries (S1–S8) in different flourishing groups. (1) low flourishing group (38.1%): Dotted line with square markers (2) moderately flourishing group (34.2%): Dotted line with triangle markers (3) high flourishing group (27.7%): Solid line with triangle markers.

Table 3 Univariate Analysis of General Information and Potential Profiles of Flourishing in 237 Patients Undergoing Postoperative Chemotherapy for Ovarian Cancer

Considerations	Category	Low Flourishing Group	Moderate Flourishing Group	High Flourishing Group
(a person's) age	<60 years	41(45.6)	40(50.0)	34(50.7)
	≥60 years	49(54.4)	40(50.0)	33(49.3)
χ^2/F value	0.520			
P value	0.771			
Place of residence	Village	55(61.1)	44(55.0)	41(61.2)
	City	35(38.9)	36(45.0)	26(38.8)
χ^2/F value	0.828			
P value	0.661			
Per capita monthly household income	<2000 RMB	48(53.3)	30(37.5)	29(43.3)
	2000~4000 RMB	32(35.6)	42(52.5)	27(40.3)
	>4000 RMB	10(11.1)	8(10.0)	11(16.4)
χ2/F value	6.772			
P value	0.148			
Marital status	Spouse	72(80.0)	54(67.5)	50(74.6)
	Single	18(20.0)	26(32.5)	17(25.4)
χ2/F value	3.469			
P value	0.177			
Educational level	Junior high school and below	63(70.0)	29(36.3)	26(38.8)
	High school/vocational high school	13(14.4)	37(46.3)	21(31.3)
	College and above	14(15.6)	14(17.5)	20(29.9)
χ2/F value	30.641			
P value	<0.001			
Body Mass Index (BMI)	<18.5 kg/m2	51(56.7)	43(53.8)	15(22.4)
	18.5≤BMI<24.0kg/m2	24(26.7)	29(36.3)	42(62.7)
	≥24 kg/m2	15(16.7)	8(10.0)	10(14.9)
χ2/F value	25.687			
P value	<0.001			
Number of chemotherapy sessions	<3 times	22(24.4)	22(27.5)	16(23.9)
	3-6 times	16(17.8)	18(22.5)	11(16.4)
	>6 times	52(57.8)	40(50.0)	40(59.7)

(*Continued*)

Table 3 (Continued).

Considerations	Category	Low Flourishing Group	Moderate Flourishing Group	High Flourishing Group
χ2/F value	1.783			
P value	0.776			
Duration of illness	3-6 months	48(53.3)	8(10.0)	19(28.4)
	7-12 months	11(12.2)	41(51.2)	33(49.3)
	>12 months	31(34.4)	31(38.8)	15(22.4)
χ2/F value	51.281			
P value	<0.001			
Number of comorbidities	<2 types	16(17.8)	27(33.8)	46(68.7)
	≥2 types	74(82.2)	53(66.3)	21(31.3)
χ2/F value	43.142			
P value	<0.001			
Tumour Staging	Stagel ~ stage II	29(32.2)	20(25.0)	26(38.8)
	Stage III ~ Stage IV	61(67.8)	60(75.0)	41(61.2)
χ2/F value	3.235			
P value	0.198			
Learned Helplessness		50.89±6.39	44.78±8.80	39.72±7.11
χ2/F value	43.735			
P value	<0.001			
Index of Autonomous Functioning		36.09±9.14	40.40±9.52	42.30±10.95
χ2/F value	8.460			
P value	<0.001			
Perceived Social Support		38.89±6.61	45.64±5.60	51.84±8.70
χ2/F value	67.062			
P value	<0.001			

Note: RMB: Chinese Yuan (CNY).

Multivariate Analysis of the Potential Profiles of Patients Undergoing Chemotherapy After Ovarian Cancer Surgery

Using the three potential profiles of flourishing as the dependent variable and the high flourishing group as the reference, multivariate logistic regression analysis was conducted with the variables that showed statistically significant differences in the univariate analysis as independent variables. Variable values: Learned Helplessness, Index of Autonomous Functioning, and Perceived Social Support were entered in their original forms; educational level was coded as follows: Junior high school or below = 1, high school/vocational high school = 2, college and above = 3; Body Mass Index (BMI): <18.5 kg/m^2 = 1, 24.0 > BMI ≥18.5 kg/m^2 = 2, ≥24.0 kg/m^2 = 3; Duration of illness: 3–6 months = 1, 7–12 months = 2, >12 months = 3; Number of comorbidities: ≥2 = 1, <2 = 2. Compared to the high flourishing group, patients undergoing

chemotherapy after ovarian cancer surgery with higher Learned Helplessness Scale scores, shorter illness duration, and more comorbidities were more likely to be classified into the low flourishing group (P<0.05). Perceived Social Support Scale and Index of Autonomous Functioning scores were higher, increasing the likelihood of classification into the moderate and high-Flourishing groups (P<0.05), as shown in Table 4.

Table 4 Multivariate Logistic Regression Analysis of Potential Categories of Flourishing in 237 Patients Undergoing Postoperative Chemotherapy for Ovarian Cancer

Low Flourishing Group VS High Flourishing Group				
Variant	**Reference**	**Regression Coefficient**	**Standard Error**	**Waldχ^2 value**
Learned Helplessness Scale		0.276	0.056	23.844
P value	<0.001			
OR value	1.318			
95% CI	1.180–1.472			
Index of Autonomous Functioning		−0.142	0.043	10.852
P value	<0.001			
OR value	0.867			
95% CI	0.797–0.944			
Perceived Social Support		−0.249	0.052	23.007
P value	<0.001			
OR value	0.779			
95% CI	0.704–0.863			
Number of comorbidities:≥2 types	<2 types	−1.719	0.661	6.767
P value	0.009			
OR value	0.179			
95% CI	0.049–0.655			
Duration of illness:7–12 months	>12 months	−2.245	0.793	8.013
P value	0.005			
OR value	0.106			
95% CI	0.022–0.501			
Learned Helplessness Scale		0.061	0.028	4.646
P value	0.031			
OR value	1.063			
95% CI	1.006–1.124			
Perceived Social Support		−0.131	0.037	12.291
P value	<0.001			
OR value	0.877			

(*Continued*)

Table 4 (Continued).

Low Flourishing Group VS High Flourishing Group				
Variant	**Reference**	**Regression Coefficient**	**Standard Error**	**Waldχ^2 value**
95% CI	0.815–0.944			
Number of comorbidities:≥2 types	<2 types	−1.076	0.438	6.021
P value	0.014			
OR value	0.341			
95% CI	0.144–0.805			
Duration of illness:3–6 months	>12 months	−1.452	0.658	4.871
P value	0.027			
OR value	0.234			
95% CI	0.064–0.850			

Discussion

This study clarified the variability in flourishing among patients with postoperative ovarian cancer undergoing chemotherapy and identified different psychological profiles and their predictive factors. The following discussion interprets these findings in light of existing research and examines their clinical implications for tailored psychosocial care.

Significant Heterogeneity Exists in Flourishing Levels Among Ovarian Cancer Patients Receiving Postoperative Chemotherapy

This study found lower flourishing scores (28.86 ± 7.91) than that reported in Ma Huili et al's study on patients with thyroid cancer.[8] Potential explanations are as follows: (1) Despite advances in treatment, the survival rates for ovarian cancer remain lower than those for other cancers. This disease trajectory creates heightened psychological stress and diminishes coping capacity in patients; (2) most patients are middle-aged and older women. Middle-aged patients often experience guilt and anxiety due to disrupted family caregiving roles,[26] while elderly patients face greater treatment side effects, develop negative treatment attitudes, and demonstrate poorer resource utilisation.[27] (3) High comorbidity burden and severe physical/mental impairment in our cohort increased the disease burden, further reducing flourishing levels.[28]

Characteristics of Latent Flourishing Profiles

This study found medium-to-low levels of overall flourishing among postoperative patients with ovarian cancer, aligning with the work of Wang Ran et al[10] and extending its relevance internationally through consistency with Cerezo et al's research on breast cancer survivors in Spain.[29] Critically, these studies collectively show that patients with lower flourishing levels consistently demonstrate impaired psychosocial functioning. This recurring cross-cultural pattern highlights the urgent need to move beyond identifying these issues and to implement stratified, actionable psychosocial interventions as part of routine oncologic care. Our latent profile analysis provides a clear framework for this stratified care approach. Three distinct profiles were identified, each offering specific guidance for psychological screening and survivorship care planning.

(1) Low flourishing group (38.1%): This profile had significantly lower flourishing scores and was associated with a longer illness duration and a greater sense of loss of control. Elevated learned helplessness indicates challenges in managing chronic conditions, weak coping strategies, and reduced self-efficacy.[30] Clinical implications: This group should be prioritised for routine psychological screening. Their care should focus on an intensive, personalised survivorship plan that includes structured interventions to help them concentrate on controllable factors, establish realistic short-term goals, and regain confidence in disease management.[31]

(2) Moderately flourishing group (34.2%): Scores suggest partial adaptation to illness. Patients remain optimistic but experience residual "coping frustration" from ineffective strategies, which limits their flourishing. Clinical implications: This group is crucial for preventive screening during follow-up. Survivorship care plans should be proactive, offering timely psychoeducation and skill training at key moments, such as before chemotherapy or during the transition to survivorship, to help prevent adverse outcomes and improve adaptive coping strategies.

(3) High flourishing group (27.7%): Patients demonstrated significant autonomy, perception of disease control, proactive self-management, and resource use. Clinical implications: Screening this group helps preserve its strengths. Survivorship care plans should focus on maintenance, detailed disease information, effective therapeutic communication, and peer-led support to foster well-being. Additionally, several important predictive factors provided further insights into the identification of these profiles. First, patients who underwent chemotherapy after ovarian cancer surgery and scored higher on the Learned Helplessness Scale were more likely to fall into the low-flourishing group. Learned helplessness describes the negative emotional and behavioural responses that develop when individuals repeatedly face uncontrollable adverse events, such as ongoing setbacks, trauma, or inescapable stressors.[32] Among ovarian cancer patients receiving postoperative chemotherapy, prolonged treatment often induces debilitating symptoms, including nausea, vomiting, fatigue, and pain. Chronic exposure to these unmodifiable stressors fosters helplessness, potentially triggering learned helplessness, which diminishes the flourishing of individuals.[33] Furthermore, most patients with ovarian cancer are diagnosed at an advanced stage, when the uncertainty of the disease leads to feelings of helplessness and diminishes psychological resilience. To address this, clinicians should systematically evaluate learned helplessness using validated tools to identify high-risk patients; implement specific interventions, such as prophylactic antiemetics prior to chemotherapy and evidence-based complementary therapies, such as acupressure for nausea; instruct patients on self-regulation techniques to improve their ability to cope with the disease; and help patients recall mastery experiences to strengthen their confidence in the treatment.[30] These strategies could collectively enhance patients' flourishing levels. Additionally, among patients with ovarian cancer receiving postoperative chemotherapy, a shorter duration of illness was associated with classification into the low-flourishing group. This study found an inverse relationship between illness duration and flourishing, with patients diagnosed more recently being significantly more likely to fall into the low-flourishing group. This may indicate severe psychological distress during the diagnostic transition, as patients often struggle to accept their diagnoses and exhibit reduced psychological resilience. As the illness persists, patients typically undergo several adaptive stages: they gain a better understanding of their condition, their fear decreases as they perceive less uncontrollability, and they transition from passive resistance to active coping strategies.[34] To enhance psychological adaptation and facilitate flourishing, clinicians should implement a three-step approach: first, provide early psychoeducation through structured disease counselling at diagnosis to encourage acceptance of the illness; second, offer prompt psychological support to transform avoidance behaviours into active coping and help realign life goals; and finally, establish formal peer networks connecting newly diagnosed patients with long-term survivors. These coordinated interventions enhanced resilience and promoted higher levels of flourishing. Moreover, patients with ovarian cancer undergoing postoperative chemotherapy were more likely to be classified into the low-flourishing group if they had more comorbidities. This study indicated that patients with ovarian cancer and higher comorbidity burden tended to have significantly lower flourishing levels. This connection likely results from increased clinical complexity, which impacts the quality of life, worsens long-term treatment symptoms, and causes negative emotional states such as despair, fear, and anxiety, which together decrease flourishing.[35] Furthermore, complex medical information on multiple conditions can lead to cognitive overload, which may reduce treatment adherence and weaken self-efficacy. To reduce these effects, clinicians should (1) conduct multidisciplinary consultations to create personalised care plans and (2) offer targeted health education to bridge knowledge gaps and reduce psychological distress, thereby supporting patients' flourishing trajectories. Protective factors were also identified. Patients undergoing post-operative chemotherapy for ovarian cancer with higher Perceived Social Support Scale scores were more likely to be classified into the high flourishing group. This study shows that higher perceived social support is associated with increased levels of flourishing among patients with ovarian cancer undergoing postoperative chemotherapy, consistent with the findings of Ma Huili et al.[7] Since most patients face late-stage diagnoses and treatment-related uncertainty, reduced confidence often leads to negative emotions that hinder well-being. Social support is a vital external resource that positively influences attitudes toward the disease and behaviour during treatment. Consequently, clinicians should prioritise assessing

social support at baseline during initial hospitalisation, focus on patients with low support by engaging peer, partner, family, and friendship networks, and maintain higher-support patients through increased communication channels. Complementary strategies, such as peer exchange platforms, family caregiver training in collaborative disease management, and clinician-delivered cognitive behavioural therapy, may further improve flourishing trajectories.[36] Finally, patients with ovarian cancer receiving postoperative chemotherapy who scored higher on the autonomous functioning index were more likely to be in the high-flourishing group. This study showed that patients with ovarian cancer who underwent postoperative chemotherapy and had higher autonomous functioning were significantly more likely to belong to the high-flourishing group. This connection stems from a greater internal motivation to manage the disease; autonomous patients are proactive in seeking treatment resources, adjust more readily to illness-related lifestyles, and implement self-care measures early.[37] Clinicians should use autonomy-supportive strategies, such as collaborative decision-making and motivational interviewing, which specifically examine the alignment of patient values with treatment goals. These approaches help improve autonomous functioning and, consequently, increase flourishing levels.

Limitations

This study has some limitations. First, using a convenience sample from a single tertiary centre limits the extent to which the results can be applied to others. Second, the lack of data on clinical confounders, such as performance status and specific chemotherapy regimens, increases the risk of residual confounding. Future research should involve multicentre, long-term studies that include a broader range of potential confounders to confirm these findings.

Conclusion

Our results revealed notable variations in thriving levels among patients undergoing postoperative chemotherapy for ovarian cancer, highlighting the importance of personalised psychological support. To support clinical adoption, we suggest a brief assessment protocol during routine follow-ups, which can be measured using short-form psychometric scales (such as those for helplessness, autonomy, and social support), supplemented by data from medical records (including illness duration and comorbidities) and structured clinical interviews. The thresholds identified in our "moderate-to-low Flourishing" subgroup provide clear indicators for intervention. In practice, if a patient scores above any of these cut-offs (for example, Learned Helplessness >44.78 or Perceived Social Support <45.64), a targeted intervention should be implemented. This aligns with a stepped-care model in which, high helplessness scores suggest the need for strategies that promote active coping, whereas low social support indicates the benefits of joining support groups.[28,34] Furthermore, promoting flourishing may offer clinical benefits beyond psychological health. Improved flourishing can increase adherence to treatment by fostering self-efficacy and encouraging healthy coping strategies. Additionally, resilience associated with flourishing may support physical recovery by promoting health-focused behaviours and better stress management. Future research should aim to validate this operational protocol, develop structured nursing strategies, and explore how flourishing enhancements influence specific clinical outcomes, such as chemotherapy completion and physical recovery. Other studies should confirm this protocol and establish organised nursing procedures to improve patient well-being. The inclusion of biological markers, such as BRAF mutations, can also help create more personalised and holistic treatment plans.[38]

Data Sharing Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Ethics Approval and Informed Consent

The research involving human subjects was approved by Fenyang Hospital of Shanxi Province (Permit No. 2024026). Participants provided written informed consent to participate in the study. The study adheres to the principles of the Declaration of Helsinki.

Consent for Publication

All authors approved the final manuscript and the submission to this journal.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

References

1. Tavares V, Marques IS, de Melo IG, et al. Paradigm shift: a comprehensive review of ovarian cancer management in an era of advancements. *Int J Mol Sci*. 2024;25(3):28. doi:10.3390/ijms25031845
2. Lheureux S, Braunstein M, Oza AM. Epithelial ovarian cancer: evolution of management in the era of precision medicine. *CA Cancer J Clin*. 2019;69(4):280–304. doi:10.3322/caac.21559
3. Xiting H, Changqing S, Liangxing C, et al. Analysis of the burden of ovarian cancer in China from 1990 to 2019 and its changing trends. *Chin J Oncol*. 2023;32(05):333–338.
4. Perrone C, Angioli R, Luvero D, et al. Targeting BRAF pathway in low-grade serous ovarian cancer. *J Gynecol Oncol*. 2024;35(4):e104. doi:10.3802/jgo.2024.35
5. Moffitt LR, Karimnia N, Wilson AL, et al. Challenges in implementing comprehensive precision medicine screening for ovarian cancer. *Curr Oncol*. 2024;31(12):8023–8038. doi:10.3390/curroncol31120592
6. Harris E, Yorke J, Law K, et al. Advanced ovarian cancer patients' experiences of surgical treatment: a qualitative analysis. *Semin Oncol Nurs*. 2024;40(4):151679. doi:10.1016/j.soncn.2024.151679
7. Sarkar S, K SP, Pal R, et al. Assessment of quality of life among advanced ovarian cancer patients in a tertiary care hospital in India. *Support Care Cancer*. 2022;30(4):3371–3378. doi:10.1007/s00520-021-06735-3
8. Rule A, Abbey C, Wang H, et al. Measurement of flourishing: a scoping review. *Front Psychol*. 2024;15:1293943. doi:10.3389/fpsyg.2024.1293943
9. Casellas-Grau A, Font A, Vives J. Positive psychology interventions in breast cancer. A systematic review. *Psychooncology*. 2014;23(1):9–19. doi:10.1002/pon.3353
10. Huili M, Rui Z, Yunli F, et al. Analysis of the current status and influencing factors of flourishing in patients after thyroid cancer surgery. *J Nurs*. 2025;40(05):11–16.
11. Ran W, Junjie L, Shuxing L.A study on the potential profile analysis and influencing factors of the flourishing category in middle-aged and young breast cancer patients. *Psychological Monthly*. 2025;20(05):12–16.
12. Harris A, Li J, Atchison K, et al. Flourishing in head and neck cancer survivors. *Cancer Med*. 2022;11(13):2561–2575. doi:10.1002/cam4.4636
13. Sung H, Ferlay J, Siegel RL, et al. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin*. 2021;71(3):209–249. doi:10.3322/caac.21660
14. Tian X, Zhou X, Sun M, et al. The effectiveness of positive psychological interventions for patients with cancer: a systematic review and meta-analysis. *J Clin Nurs*. 2024;33(9):3752–3774. doi:10.1111/jocn.17358
15. Curren R, Park SS. Flourishing and integrative emotion regulation: an SDT perspective. *Front Psychol*. 2024;15:1409377. doi:10.3389/fpsyg.2024.1409377
16. Flannery M. Self-determination theory: intrinsic motivation and behavioral change. *Oncol nurs forum*. 2017;44(2):155. doi:10.1188/17.ONF.155-156
17. Ping N, Jingli C, Liu N.Sample size estimation in quantitative research in nursing studies. *Chin J Nurs*. 2010;45(04):378–380.
18. Diener E, Wirtz D, Tov W, et al. New well-being measures: short scales to assess flourishing and positive and negative feelings. *Soc Indic Res*. 2010;97(2):143–156. doi:10.1007/s11205-009-9493-y
19. Qiaozhen L. *Research on the Flourishing State of College Students and Its Application in the Dual-Factor Model of Mental Health*. Southern Medical University; 2017.
20. Joy JL, Ramachandran M, George S. Learned helplessness, psychological wellbeing, and proenvironment care behavior among victims of frequent floods in Kerala. *J Neurosci Rural Pract*. 2021;12(1):137–144. doi:10.1055/s-0040-1721566
21. Sisi Y, Zhaoli Z, Ling T, et al. Chinese translation of the learned helplessness scale and its reliability and validity testing among cancer patients. *Chongqing Med*. 2023;52(23):3672–3675.
22. Weinstein NPAKR, Przybylski AK, Ryan RM. The index of autonomous functioning: development of a scale of human autonomy. *J Res Personality*. 2012;46(4):397–413. doi:10.1016/j.jrp.2012.03.007

23. Jiayu W, Lei L, Hui C, et al. Chinese translation and reliability and validity testing of the index of autonomous functioning. *Nursres*. 2023;37 (24):4413–4416.
24. Zimet GD, Powell SS, Farley GK, et al. Psychometric characteristics of the multidimensional scale of perceived social support. *J Pers Assess*. 1990;55(3–4):610–617. doi:10.1080/00223891.1990.9674095
25. Jiang Q.Perceived social support scale. *Chin J Behav Med*. 2001;10(10):41–43.
26. Yuping C, Tao J, Qingwen S, et al. A study on the development trajectory of psychological distress in patients with ovarian cancer after surgery and its influencing factors. *J Nurs Manage*. 2024;24(11):968–972.
27. Wall JA, Lipking K, Smith HJ, Huh WK, Salter T, Liang MI. Moderate to severe distress in half of ovarian cancer patients undergoing treatment highlights a need for more proactive symptom and psychosocial management. *Gynecol Oncol*. 2022;166(3):503–507. doi:10.1016/j.ygyno.2022.06.016
28. Ou M, Wang G, Yan Y, Chen H, Xu X. Perioperative symptom burden and its influencing factors in patients with oral cancer: a longitudinal study. *Asia Pac J Oncol Nurs*. 2022;9(8):100073. doi:10.1016/j.apjon.2022.100073
29. Cerezo MV, Soria-Reyes LM, Alarcón R, Blanca MJ. The flourishing scale: psychometric properties in breast cancer patients. *Integr Cancer Ther*. 2024;23:15347354241249935. doi:10.1177/15347354241249935
30. Huang F, Shi Y, Ding L, Huang J, Zhang Z. Learned helplessness and associated factors among patients with lung cancer. *Patient Prefer Adhere*. 2024;18:467–474. doi:10.2147/PPA.S446523
31. de Rooij BH, Thomas TH, Post KE, et al. Survivorship care planning in gynecologic oncology-perspectives from patients, caregivers, and health care providers. *J Cancer Surviv*. 2018;12(6):762–774. doi:10.1007/s11764-018-0713-9
32. Maier SF, Seligman ME. Learned helplessness at fifty: insights from neuroscience. *Psychol Rev*. 2016;123(4):349–367. doi:10.1037/rev0000033
33. Siqin L, Hong L, Manbo W, et al. Current status and influencing factors of learned helplessness in breast cancer patients. *Chin Nurs Educ*. 2024;21 (01):68–73.(in.
34. Shihui L, Tiantian W, Chao Z, et al. Current status and influencing factors of personal sense of control in ovarian cancer patients. *Tianjin Nursing*. 2023;31(06):637–641.(in.
35. Noto B, Asmus I, Schäfers M, Görlich D, Riemann B. Predictors of anxiety and depression in differentiated thyroid cancer survivors: results of a cross-sectional study. *Thyroid*. 2022;32(9):1077–1085. doi:10.1089/thy.2022.0067
36. Lau N, Steineck A, Walsh C, et al. Social support resources in adolescents and young adults with advanced cancer: a qualitative analysis. *BMC Palliat Care*. 2024;23(1):193. doi:10.1186/s12904-024-01527-y
37. van Dongen SI, de Nooijer K, Cramm JM, et al. Self-management of patients with advanced cancer: a systematic review of experiences and attitudes. *Palliat Med*. 2020;34(2):160–178. doi:10.1177/026921631988397
38. Tonti N, Golia D'Augè T, Cuccu I, et al. The role of tumor biomarkers in tailoring the approach to advanced ovarian cancer. *Int J Mol Sci*. 2024;25 (20):11239. doi:10.3390/ijms252011239