

ARTICLE

# Analysis of Status and Influencing Factors of Psychology Resilience Level in Cancer Patients Undergoing Radiotherapy and Chemotherapy

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## ABSTRACT

**Objective:** To analyse the status and discuss influencing factors of the psychology resilience level of cancer patients undergoing radiotherapy and chemotherapy, and to provide evidence for clinical rehabilitation intervention. **Methods:** A total of 320 patients with cancer undergoing radiotherapy and chemotherapy who were hospitalized in the Affiliated Hospital of North China University of Science and Technology and Tangshan Worker's Hospital in China from September 2022 to November 2022 were selected as the research subjects. The surveys were conducted using the general information questionnaire, Connor-Davidson Scale (CD-RICS), Perceived Social Support Scale (PSSS) and Pittsburgh Sleep Quality Index Scale (PSQI). **Results:** The psychology resilience score of cancer patients undergoing radiotherapy and chemotherapy was  $64.23 \pm 15.20$ , lower than the average level of resilience of adults in China ( $70.50 \pm 13.48$ ) and American adults' normal value ( $80.4 \pm 12.8$ ). Perceived social support was  $58.13 \pm 14.04$  and positively correlated with the level of psychology resilience ( $r = 0.210, P < 0.05$ ). Sleep quality was  $10.57 \pm 4.85$ , which showed most people have sleep quality disorder and was negatively correlated with the level of psychology resilience ( $r = -0.200, P < 0.05$ ). Multiple linear regression analysis showed that age, education level and disease stage were the main influencing factors in the level of psychological resilience in cancer patients undergoing radiotherapy and chemotherapy ( $P < 0.05$ ). **Conclusions:** The level of psychological resilience of cancer patients undergoing radiotherapy and chemotherapy is at a low level, and there are many influencing factors. Targeted medical care should be carried out according to the factors affecting the level of resilience to promote the mental health of patients.

**Keyword:** Psychology resilience; Chemotherapy; Radiotherapy

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## 1. Introduction

In recent years, the number of cancer patients around the world is on the rise, and the age of cancer patients is becoming younger. The Cancer Progress report released by the American Association for Cancer Research (AACR) in 2017 predicts that the number of new cases of cancer worldwide may increase from 15.2 million to 24 million in 2035<sup>[1]</sup>. With the increasing incidence of malignant tumours and the continuous progress of medical technology, the cure rate and survival rate of cancer patients are also increasing year by year worldwide<sup>[2]</sup>. Radiotherapy and chemotherapy are two important means of cancer treatment that can effectively control or destroy cancer cells which have been widely recognized and achieved good curative effects. However, in addition to bringing economic pressure to patients, these treatments will also cause a series of related symptoms, such as pain, vomiting, nausea, constipation, and other symptoms that weaken the patient's physical and mental function, cause cancer-related fatigue, and then reduce the patient's enthusiasm for treatment and compliance, affecting the rehabilitation effect and quality of life of patients in the later period. At present, the research on the psychological characteristics of patients with cancer radiotherapy and chemotherapy is mostly focused on negative psychological factors such as anxiety and depression, while there are few studies on the subjective positive initiative of individual patients. Psychological resilience belongs to the category of positive psychology, which can help individuals achieve good adaptation in times of adversity<sup>[3]</sup>. American Psychology Association<sup>[4]</sup> defined psychology resilience as the good adaptation process of individuals in the face of adversity trauma, tragedy, threats or other major pressures. It has been pointed out<sup>[5]</sup> that psychological resilience can prevent the adverse effects of single symptoms on patient outcomes. Therefore, this study aims to investigate the status of the psychological resilience level of patients with cancer radiotherapy and chemotherapy, and analyse its influencing factors, to provide a basis for improving the rehabilitation effect of patients.

## 2. Materials and methods

### 2.1 Participants

Using the cross-sectional sampling method, cancer patients who were hospitalized in the Affiliated Hospital of North China University of Science and Technology and Tangshan Worker's Hospital in China from September 2022 to November 2022 were selected as the research subjects. According to the requirements of statistical variable analysis, the number of samples is 10-20 times the number of variables. There are 13 variables involved in this study, and the sample size is 130-260 cases. Here, it is calculated by 20 times. Considering the loss to follow-up rate of 15%, the final sample size of this study should be at least 299 cases. The questionnaires were distributed to 340 patients, 320 questionnaires of valid answers were collected after excluding invalid answers, and the effective recovery rate was 94.12%. Inclusion criteria: (1) age  $\geq$  18 years old; (2) patients diagnosed with cancer and hospitalized for radiotherapy, chemotherapy and radiochemotherapy; (3) patients who received standard cycles of chemotherapy and radiotherapy and completed the treatment cycle; (4) have cognition function to cooperate with researchers; (5) volunteer to participate in this study after explaining the purpose of this study. Exclusion criteria include (1) patients suffering from other serious physical and mental diseases or complicated with serious complications; (2) patients who have not completed the treatment cycle; (3) patients who cannot cooperate with investigators due to communication or cognitive impairments.

### 2.2 Methods

#### *General information questionnaire*

The questionnaire was self-designed, and its content mainly includes age, gender, education level, economic situation, marital status, tumour type, duration of illness, and stage of illness.

#### *Connor-Davidson Scale (CD-RICS)*

This scale was compiled by American scholars<sup>[6]</sup> and translated by Chinese scholars<sup>[7]</sup>. It was

used to measure the positive psychological quality of individuals in coping with adversity. There are 25 items in total, using Likert 5-level scoring, from “completely inconsistent” to “completely consistent” scoring 0 to 4 points, with a total score of 100 points. A higher score indicates a higher level of resilience. The Cronbach’s  $\alpha$  coefficient of the scale is 0.91 in this study, which has good reliability.

#### **Perceived social support**

The Perceived Social Support Scale (PSSS) was compiled by Zimet et al. [8] and translated by Jiang Qianjin [9]. It is a social support scale that emphasizes individual self-understanding and self-feeling. At the same time, the total score reflects the total degree of social support that the individual feels. PSSS contains 12 self-assessment items, and each item uses a seven-point scoring method from 1 to 7, which are strongly disagree, strongly disagree, slightly disagree, neutral, slightly agree, strongly agree, and strongly agree, total score of 12-84 points. According to the total score of the scale, perceived social support is divided into 3 levels, 12-36 is the low level, 37-60 is the medium level, and 61-84 is the high level. The questionnaire has good reliability and validity, and Cronbach’s  $\alpha$  of the total scale is 0.922 in this study.

#### **Pittsburgh Sleep Quality Index Scale (PSQI)**

The scale was compiled by Byssse et al. [10] of Pittsburgh Medical Center in 1989, to measure the subjective sleep quality of the patient in the last month. The score of each component is the total score of PSQI, and the total score ranges from 0 to 21 points. The higher the score, the worse the sleep quality, and the PSQI > 7 points means that there is a sleep quality disorder. The Cronbach’s  $\alpha$  of this scale in this study is 0.84 in this study.

### **2.3 Investigation method**

After explaining the purpose of the study to the patients and obtaining consent, the researcher signed the informed consent form. Questionnaires were issued and collected on the spot, and the quality of the questionnaires was checked immediately, and patients were asked to modify them in time if any prob-

lems were found. Patients completed the questionnaire in a quiet environment. After the questionnaires were collected, all data were entered and checked by two persons at the same time.

### **2.4 Statistical methods**

Using SPSS 26.0 for data analysis. The measurement data were all in a normal distribution, and the measurement data were represented by mean  $\pm$  standard deviation ( $x \pm s$ ), and the count data were represented by frequency and percentage; *t*-test and one-way analysis of variance was used to conduct single-factor analysis on the psychology resilience level of patients with cancer radiotherapy and chemotherapy; Pearson correlation was used to analyse the correlation between psychology resilience, perceived social support and sleep quality; multiple linear regression was performed with factors with statistically significant differences in univariate and correlation analysis as independent variables, and  $P < 0.05$  was considered statistically significant.

## **3. Result**

### **3.1 Univariate analysis of cancer-related fatigue in patients with cancer radiotherapy and chemotherapy**

The single factor results showed that there were statistically significant differences in the psychology resilience scores of different ages, occupations, education levels, payment methods, economic conditions, tumour types, disease stages, metastasis, social cognitive support, and sleep disorders ( $P < 0.05$ ). see **Table 1**.

### **3.2 Correlation analysis of psychology resilience, perceived social support and sleep quality in patients with cancer radiotherapy and chemotherapy**

The results showed that the score of the patient’s psychology resilience level in this study was ( $64.23 \pm 15.20$ ). Perceived social support was ( $58.13 \pm 14.04$ ) and positively correlated with the level of psychology

resilience ( $r = 0.210, P < 0.05$ ). Sleep quality ( $10.57 \pm 4.85$ ) showed that most people have sleep quality disorder and was negatively correlated with the level of psychology resilience ( $r = -0.200, P < 0.05$ ). See **Table 2**.

### 3.3 Multivariate linear regression analysis on the factors affecting the psychology resilience of patients with tumour radiotherapy and chemotherapy

The total score of the psychology resilience scale was used as the dependent variable, and the variable with statistical significance in the univariate analysis

was used as the independent variable for multiple linear regression analysis. The results showed that age, education level, staging nature of the disease, perceived social support and sleep quality were the main factors affecting the psychology resilience level of cancer patients undergoing radiotherapy and chemotherapy ( $P < 0.05$ ), which could explain 28.8% of the total variables. The variable assignment method is shown in **Table 3**, and the multivariate analysis results of factors affecting the psychology resilience level of cancer patients undergoing radiotherapy and chemotherapy are shown in **Table 4**.

**Table 1.** Differences in psychology resilience when grouped according to profile ( $x \pm s$ ) ( $n = 320$ ).

Group	N	Resilience level	t/F	P
Age			6.982	0.001
< 50 years old	33	72.58 ± 17.15		
50-59 years old	167	64.44 ± 15.32		
≥ 60 years old	120	61.64 ± 13.67		
Gender			1.481	0.140
Male	127	65.78 ± 14.46		
Female	193	63.21 ± 15.63		
Education level			20.658	0.000
Primary school and below	50	53.14 ± 12.96		
Junior high school	93	61.76 ± 12.80		
High school	101	65.82 ± 14.81		
Bachelor degree or above	76	72.44 ± 14.78		
Payment method			3.271	0.039
Own expense	5	62.40 ± 13.61		
Residential medical insurance	253	63.19 ± 15.20		
Employee insurance	62	68.63 ± 14.76		
Personal monthly income			6.772	0.000
< 2000	109	59.09 ± 14.76		
2000-3000	85	66.26 ± 14.52		
3000-5000	97	67.58 ± 14.65		
> 5000	29	66.41 ± 16.31		
Marital status			1.938	0.123
Married	276	64.20 ± 15.40		
Single	18	64.89 ± 14.09		
Divorced	10	73.10 ± 15.67		
Widow/Widower	16	58.44 ± 10.33		
Diagnose			2.677	0.047

Table 1 continued

Group	N	Resilience level	t/F	P
Gynecologic oncology	136	63.88 ± 15.89		
Head and neck tumours	64	64.72 ± 15.18		
Digestive tract tumours	47	69.19 ± 16.50		
Chest tumours	73	61.27 ± 12.24		
Years of illness			2.436	0.089
< 1 year	245	65.26 ± 15.43		
1-5 years	67	60.97 ± 13.10		
> 5 years	8	60.00 ± 21.32		
Staging nature of disease			8.312	0.000
Stage I	13	73.54 ± 11.22		
Stage II	147	65.70 ± 14.12		
Stage III	115	64.94 ± 16.34		
Stage IV	45	54.93 ± 12.85		
Metastasis			-3.367	0.001
Yes	84	59.51 ± 15.00		
No	236	65.91 ± 14.95		
Surgery			1.580	0.115
Yes	85	66.46 ± 15.92		
No	235	63.43 ± 14.88		

Table 2. Correlation between psychological resilience, perceived social support and sleep quality (n = 320).

Variable	Score ( $\bar{x} \pm s$ )	Psychology resilience	Perceived social support	Sleep quality
Psychology resilience	64.23 ± 15.20	1.000	0.210 *	-0.200 *
Perceived social support	58.13 ± 14.04	0.210 *	1.000	-0.200 *
Sleep quality	10.57 ± 4.85	-0.200 *	-0.200 *	1.000

Table 3. Independent variable assignment method.

Variable	Assignment method
Age	< 50 years old = 1, 50-60 years old = 2, ≥ 60 years old = 3
Education level	Bachelor's degree and below = 1, junior high school = 2, high school = 3, undergraduate and above = 4
Payment method	Self-pay = 1, resident medical insurance = 2, employee insurance = 3
Personal monthly income	< 2000 = 1, 2000-3000 = 2, 3000-5000 = 3, > 5000 = 4;
Diagnose	Gynecological tumours = 1, head and neck tumours = 2, digestive tract tumours = 3, breast tumours = 4;
Staging nature of disease	Stage I = 1, Stage II = 2, Stage III = 3, Stage IV = 4
Metastasis	yes = 1, no = 2
Perceived social support	the original value
Sleep quality	the original value
Psychology resilience	the original value

**Table 4.** Multivariate analysis of factors affecting psychology resilience ( $n = 320$ ).

Constants and arguments	Standard error	Beta	t	P	B value (95% CI of B value)
(constant)	9.443		6.071	0	57.324 (38.743-75.905)
Age	1.196	-0.119	-2.376	0.018	-2.842 (-0.519-0.489)
Education level	0.943	0.413	6.592	0.000	6.216 (4.36-8.071)
Payment method	2.202	-0.029	-0.468	0.64	-1.03 (-5.363-3.303)
Personal monthly income	0.913	-0.063	-1.053	0.293	-0.962 (-2.758-0.835)
Diagnose	0.694	0.004	0.076	0.94	0.052 (-1.312-1.417)
Staging nature of disease	1.165	-0.135	-2.269	0.024	-2.643 (-4.935-0.351)
Metastasis	2.151	0.113	1.815	0.071	3.904 (0.329-8.136)
Perceived social support	0.053	0.17	3.506	0.001	0.184 (0.081-0.288)
Sleep quality	0.153	-0.183	-3.764	0.000	-0.574 (-0.875-0.274)

Note:  $F = 13.910$ ,  $P < 0.001$ ;  $R^2 = 0.310$ ,  $\Delta R^2 = 0.288$ .

## 4. Discussion

### 4.1 The status quo of the resilience level of cancer patients undergoing radiotherapy and chemotherapy

The results of this study showed that the score of the psychology resilience of cancer patients undergoing radiotherapy and chemotherapy was ( $64.23 \pm 15.20$ ), which is significantly lower than the average level of resilience of adults in China ( $70.50 \pm 13.48$ )<sup>[11]</sup>, and also lower than that of American adults' normal value ( $80.4 \pm 12.8$ )<sup>[6]</sup>. It showed that the level of psychological resilience in patients undergoing cancer radiotherapy and chemotherapy is low. This may be because cancer itself, as a stressor, easily leads to a series of adverse symptoms, which leads to the impairment of patients' physiological functions, changes in their external image, influences their normal living ability and social participation ability, leads to psychological problems such as anxiety and depression, and reduces their disease adaptability. At the same time, studies have shown that chemoradiotherapy in the treatment of cancer will produce a variety of adverse reactions to the human body, such as serious gastrointestinal reactions, bone marrow suppression, toxicity, and so on<sup>[12]</sup>. These adverse reactions have a long duration and great effect on patients, seriously affecting the quality of life of patients, cancer treatment and prognosis and leading to aggravated psychological pain in patients<sup>[13]</sup>.

### 4.2 Age

The results of the study showed that the older the patients, the lower the level of psychological resilience. This is consistent with the research results of Chinese scholars et al.<sup>[14]</sup>. As people age, the body's metabolic rate and immune system function begin to decline. When older patients receive chemotherapy and radiotherapy, their tolerance for pain is reduced, and they are more likely to have negative emotions such as tension, anxiety, or depression during disease treatment, and their confidence in the recovery of later treatment effects and physical functions is reduced, which in turn affects the level of psychology resilience of the patient. This suggests that clinical medical staff should pay more attention to the psychological state of elderly patients with cancer radiotherapy and chemotherapy, fully understand and encourage them to face the disease and improve treatment compliance.

### 4.3 Education level

The results of the study show that the higher the education level of cancer patients undergoing radiotherapy and chemotherapy, the higher the level of psychological resilience, which is consistent with the research results of Qiu Xiaofeng et al.<sup>[15]</sup>. People with higher education usually have a wider knowledge reserve, stronger critical analysis ability, can adopt a positive attitude to face difficulties, and

help themselves better understand the development of the disease, thereby reducing the uncertainty of uncertainty. At the same time, patients with a higher education level tend to have better cognitive and management capabilities for their own emotions and emotions. When facing negative events, they can better identify their own emotional state and adjust effectively to cope with stress or adversity. In addition, an educational level generally represents an individual's social status and economic conditions<sup>[16]</sup>. Patients with a high educational level have lower economic pressure and can seek better medical resources to solve disease problems, so the level of psychological resilience increases accordingly. It is suggested that clinical medical staff need to improve psychological care for patients with low education level, and guide patients to actively face the disease.

#### **4.4 Staging nature of disease**

The results of the study showed that the higher the stage of the disease, the lower the level of psychology resilience with the trend of psychology resilience observed by Costanzo<sup>[17]</sup>. The reason may be that before receiving induction chemotherapy, the main symptoms of the patient were nausea, headache, nosebleed, hearing loss, and vomiting, and the fatigue was mild. The higher the disease stage, the larger the patient's tumour, the wider the spread, the poorer the treatment effect, and the adverse reactions increased. After the start of radiotherapy and chemotherapy, the patient's head, neck, and systemic reactions aggravated at the same time. Dysgeusia, loss of appetite, radiation dermatitis, etc. coexisted with fatigue and interacted with each other. By the end of radiotherapy, fatigue or distress had reached its peak. The uncertainty and fear brought about by the disease lower the patient's expectations for disease recovery and reduce treatment compliance. At the same time, in addition to facing the failure of treatment and the deterioration of the disease, patients with advanced stage also face the fear of death at any time, and their psychological state will also be poor. Therefore, clinical medical staff should pay attention to monitoring the mental state of patients

in the middle and late stages, provide psychological counseling, and help patients relieve the pain caused by the disease.

#### **4.5 Perceived social support**

The results showed that perceived social support was positively correlated with psychological resilience. The result is consistent with that of Zhao Lihui et al.<sup>[18]</sup>. Perceived social support means that patients can feel the emotional experience and satisfaction degree of understanding, care, support, and encouragement from the outside world, which is an important factor affecting the quality of life<sup>[19]</sup>. In the face of great pressure or difficulties, patients need not only external social support, but also subjective feelings and acceptance of these support, and form their own motivation to play a huge role. When patients face illness, patients with a high level of perceived social support have higher self-efficacy<sup>[20]</sup>, the easier it is for individuals to face adversity in a positive way, and is good at using social support to adjust their emotions and find ways to deal with them, so that patients' stress response and negative emotions decrease and their sense of despair about the disease decreases<sup>[21]</sup>. Therefore, family or community centers should focus on providing social support to patients and helping them establish a positive attitude.

#### **4.6 Sleep quality**

The results showed that the quality of sleep was negatively correlated with the level of psychological resilience. The reason may be that poor sleep quality will cause hypothalamic-pituitary-adrenal axis disorder and inflammatory reaction<sup>[22]</sup>, which will delay the recovery and progress of the disease. At the same time, the human body usually takes glucose in the body during sleep. When sleep is insufficient, glucose intake decreases, and the prefrontal cortex energy is insufficient, which leads to the impairment of brain function, thus causing the patient's self-control ability to decline. Patients often look at things with negative thinking, and their ability to under-

stand, judge and deal with things decreases, which is more likely to produce negative expressions such as disgust and dissatisfaction<sup>[23]</sup> and negative emotions such as anxiety, depression and stress. Therefore, clinical medical staff should pay attention to improving patients' sleep quality, which is of great significance to reducing their stress levels and improving their coping ability and psychological resilience.

## 5. Conclusions

The results of this study showed that the level of psychological resilience of cancer patients undergoing radiotherapy and chemotherapy is low, and age, educational level, staging nature of the disease, perceived social support and sleep quality are the influencing factors. With the proposal and development of the Socio-Psycho-Biomedical model, the model advocates that human health is not only the absence of physical disease, but also physical health, mental balance, and good social adaptation. Therefore, in the management of patients' psychology resilience in the future, medical staff can focus on these influencing factors, and timely implement precise prevention and treatment programs for cancer patients undergoing chemotherapy and radiotherapy who are considered to have low psychology resilience, so as to further improve the prognosis of patients.

## Author Contributions

Xu Liya: Data analysis and writing.

Dr. Lida C. Landicho: Formal analysis.

Dr. Elna R. Lopez: Validation.

## Conflict of Interest

There is no conflict of interest.

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## Statement

This research was reviewed by the Ethics Committee of North China University of Science and Technology, Ethical Review No. (2021062), and the research participants all signed the informed consent form.

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