


The Influencing Factors of Psychosocial Adaptation of Cancer Patients: A Systematic Review and Meta-Analysis

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ABSTRACT

PURPOSE: The psycho-social adaptation of cancer patients is very important, which affects the treatment, rehabilitation process and prognosis of patients, and is closely related to the subjective well-being and quality of life of patients. However, the key factors affecting the psycho-social adjustment of cancer patients are not clear yet. This study aims to evaluate the psycho-social adaptation of cancer patients and its influencing factors based on a meta-analysis.

BASIC PROCEDURES: The Systematic review was conducted following the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) checklist and guided by the society-to-cell model framework. Literature retrieval was conducted from the construction of the library to December 2023.

MAIN FINDINGS: Fourteen pieces of literature were included in this study, with a total sample size of 2922 cases. Among the 14 literatures included, 9 were in English and 5 were in Chinese, published between 1991 and 2021. All of the 14 literatures were cross-sectional studies. According to the society-to-cells model framework, the influencing factors are divided into 5 levels: society, community, family, individual, and physiology. However, studies related to the cellular level are lacking.

PRINCIPAL CONCLUSIONS: The psychosocial adaptation of cancer patients is affected by physiology, individual, family, community and society, among which age, education level, disease uncertainty, hope level, psychological pain, self-efficacy, social support, coping styles (facing, avoidance, submission, and emotion-oriented) are the main factors affecting the psychosocial adaptation of cancer patients. However, studies related to the cellular level are lacking. This may be due to the fact that most of the factors from the individual to the society level are intervenable, and most studies focus more on the mining of these levels of factors. However, the biological basis is crucial to the occurrence and development of diseases, and needs to be paid attention to by nursing staff, and further research on this level needs to be strengthened in the future.

KEYWORDS: Cancer, psycho-social adaptation, influencing factors, systematic review, meta-analysis, psychosocial oncology

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Introduction

According to the latest cancer data generated globally by the International Agency for Research on Cancer (IARC), a specialized cancer agency of the World Health Organization, 9.96 million global deaths were due to cancer in 2020. Additionally, the number of new cancer cases and cancer-related deaths in China ranks first globally, accounting for 23.7% of new cases and 30% of global deaths, resulting in heavy economic and disease burdens to China.¹ With the rapid development of medical technologies and the vigorous implementation of cancer prevention and control strategies, the survival time of patients has been prolonged.² Still, regardless of the type of cancer and the type of treatment used, the disease itself and/or side effects of treatment result in substantial risks

and challenges to cancer patients, likely resulting in significant psychosocial adaptation for cancer patients.³ Psychosocial adaptation refers to the individual's coping response to various complex problems associated with cancer survival, including physiological adaptation, psychological adaptation, and social adaptation, among which psychosocial adaptation deserves special attention.⁴ Psychosocial adaptations of cancer patients refer to the dynamic process in which patients deal with emotional stress, solve specific cancer-related problems, and gain a sense of control over cancer-related life events. In essence, the term psychosocial adaptation refers to the way in which people cope with various complex problems throughout the post-cancer survival period.⁵ In addition to affecting treatment and recovery of cancer patients, psychosocial adaptation has a



direct impact on their subjective well-being and quality of life.⁶ And there are many complicated factors may affect the psychosocial adaptation of cancer patients, including individual context (beliefs about illness, personal background, resilience, coping strategies, and so on), supportive system (family, society and human interactions in health), and self-comparison.⁷ However, psychosocial adaptation cannot be analyzed at a single dimension, which lacks a comprehensive and systematic consideration, and lack certain theoretical support.^{4,7} Investigations from Sarah L and colleagues put forward the social-to-cells resilience model,⁸ which emphasizes that individuals may develop resiliency by achieving a state of total physical and mental health in order to cope with the challenges they are struggling with. According to the framework, an individual's psychosocial adaptation depends on the interaction between cellular, physiology, individual, family, community and society factors, and the interaction of these 6 factors leads to different psychosocial adaptation trajectories. This process is comprehensively influenced by social, community, family, as well as physiological, psychological, and cellular adaptability. The society-to-cells resilience model formalizes and extends this holistic approach to nursing.

Aims

The purpose of this study is to systematically review domestic and foreign research on the influencing factors of psychosocial adaptations for cancer patients under the guidance of society-to-cells framework in order to provide an evidence-based and theoretical basis for improving the psychosocial adaptations of cancer patients.

Methods

This review study was preregistered and conducted following the PRISMA guidelines (Supplemental file_ PRISMA_2020_checklist).

Inclusion and exclusion criteria

Inclusion criteria. (a) Study types: cross-sectional studies, case-control studies, or cohort studies; (b) Subjects: cancer patients aged ≥ 18 years, from diagnosis to treatment, without limiting cancer types; (c) Psychosocial adaptation evaluations in studies that were evaluated using the Psychosocial Adjustment to Illness Scale (PAIS), which assessed the psychological adaptation of patients characteristically, and was used as inclusion criteria because the use of a single scale facilitates analysis and reduces heterogeneity^{9,10}; (d) Studies that focused on the psychosocial adaptation of cancer patients and related equivalent topics; (e) The language of the research was either in Chinese or English.

Exclusion criteria. (a) Unpublished, repeatedly published, or cross-published articles and documents; (b) Literature with incomplete research data, apparent errors in data or inability to convert and apply the data; (c) Only abstracts were published, or full-text documents were not able to be obtained.

Search strategy

We conducted an electronic search of the following databases: Cochrane Library, Medline, CINAHL, EMBASE, PsycINFO, Web of Science, SinoMed, China Hownet Periodical Databank, China Sci-tech Periodical Database, and Wanfang Data Resource System. The search terms can be found in Supplemental_1. All of the utilized literature was identified using the combination of subject headings and free words and proper use of the truncation operators. The retrieval language was Chinese or English, supplemented by manual retrieval and snowballing, and the retrieval time was designated as the time from the establishment of the database to December 2023.

Selection procedure and data extraction

The documents were imported using endnote, and duplicates were removed after double checked by 2 researchers. After removing duplicate studies, the titles and abstracts were first reviewed independently by 2 researchers and unsuitable studies (flow chart) were excluded. Following these initial steps, the researchers then read the full text of the screened documents to determine which documents were to be included in the final analysis. Disagreements between reviewers about studies' eligibility were resolved by a third reviewer and consensus. The relevant data were extracted according to the pre-established data extraction table (Table 1). We use PAIS to measure the psychosocial adaptation of patients. A higher Likert score suggests a lower psychosocial adaptation level of the individual. Therefore, in the correlation coefficient extracted from the research results, the sign is negative ("-"), signifying that the factor is positively correlated with psychosocial adaptation, and the sign is positive ("+"), signifying that the factor is negatively correlated with psychosocial adaptation.

Quality assessment

Two researchers independently evaluated the 14 studies included in this study using the Joanna Briggs Institute (JBI) Model for Evidence-Based Healthcare for Cross-sectional Studies.¹¹ The tool has 8 items in total, and each item is evaluated as "yes", "unclear", and "inapplicable" with a total score ranging from 0 to 16 points. Disagreements between reviewers about evaluation results were resolved by consensus.

Statistical analysis

After utilizing Fisher's Z transformation of the extracted data, quantitative synthesis, and statistical analysis was carried out using the RevMan5.3 software. The combined Summary Fisher's Z value was obtained, which was converted into a Summary R-value. The transformation formula is as follows¹²:

$$(a) \text{ Fisher's } Z = 0.5 \times \ln \frac{1+r}{1-r};$$

$$(b) \text{ SE} = \sqrt{\frac{1}{n-3}} \quad (n \text{ is the sample size of the study});$$

$$(c) \text{ Summary } r = \frac{e^{2Z} - 1}{e^{2Z} + 1} \quad (Z \text{ is the Summary Fisher's } Z \text{ value})$$

Table 1. Main characteristics of included studies.

NUMBER	AUTHOR	YEAR	COUNTRY	RESEARCH TYPE	SAMPLE SIZE	AGE	CANCER TYPES	TOTAL SCORE OF PSYCHO-SOCIAL ADAPTATION	INFLUENCING FACTORS	QUALITY EVALUATION
1	Liu Kehua, et al	2021	China	Cross-sectional study	155	59.33 ± 12.18	Colorectal cancer	52.59 ± 19.64	(12) (13) (14) (15)	10
2	Lan Jie, et al	2019	China	Cross-sectional study	175	51.43 ± 7.74	Lung cancer	43.21 ± 8.52	(18)	10
3	Shen Aomei, et al	2017	China	Cross-sectional study	817	48.52 ± 9.73	Breast cancer	46.00 ± 13.78	(12) (13) (14) (15) (19) (27)	15
4	Zhang Ruiqin, et al	2021	China	Cross-sectional study	263	18~40	Breast cancer	50.31 ± 12.26	(27) (28)	10
5	Shen Aomei, et al	2017	China	Cross-sectional study	320	48.12 ± 9.95	Breast cancer	47.32 ± 16.65	(19)	16
6	Westbrook JM, et al	2005	America	Cross-sectional study	137	47.99 ± 10.25	Breast cancer	74.04 ± 14.84	(11) (16) (17) (21) (29)	13
7	Barton MA, et al	2001	America	Cross-sectional study	149	65.67 ± 10.12	Pan-cancer	350 ± 47.97 (After standardizing T score)	(1) (2) (7) (30)	16
8	Ben-Zur H, et al	2015	Israel	Cross-sectional study	200	62.52 ± 6.18	Digestive system cancer	/	(22) (23) (24)	15
9	Mazanec SR, et al	2011	America	Cross-sectional study	80	62.28 ± 12.92	Pan-cancer	349.58 ± 50.75 (After standardizing T score)	(1) (9) (10) (12) (18) (27)	16
10	Taghdosi M, et al	2017	Iran	Cross-sectional study	260	54.76 ± 13.82	Pan-cancer	50.10 ± 17.18	(3)	11
11	Gotcher JM, et al	1991	America	Cross-sectional study	102	62 ± 14.7	Pan-cancer	22.55 ± 8.4	(31)	16
12	Li CC, et al	2012	Taiwan	Cross-sectional study	45	62.87 ± 11.46	Colorectal cancer	43.61 ± 21.60	(6) (8) (20)	15
13	Sanaha C, et al	2000	Thailand	Cross-sectional study	129	50.2 ± 12.2	Breast cancer	/	(1) (2) (4) (5) (16) (25) (26)	16
14	Gumus AB, et al	2011	Turkey	Cross-sectional study	90	49.35 ± 10.99	Breast cancer	/	(21)	12

Note. (1) Age; (2) Education level; (3) Religious belief; (4) Perceived financial ability; (5) Course of disease; (6) The severity of the disease; (7) Treatment mode; (8) Postoperative time; (9) Complications; (10) Symptoms are troubled; (11) Optimism; (12) Self-efficacy; (13) Confrontation coping strategy; (14) Avoidance coping strategy; (15) Acceptance coping style; (16) Emotion-oriented coping; (17) Task-oriented coping; (18) Uncertainty of disease; (19) Hope; (20) Spiritual well-being; (21) Psychological pain; (22) Positive role; (23) Negative effects; (24) Post-traumatic stress symptoms; (25) Cognitive evaluation; (26) Marital status; (27) Social support; (28) Family resilience; (29) Adult attachment; (30) Family environment; (31) Communication between patients' families.

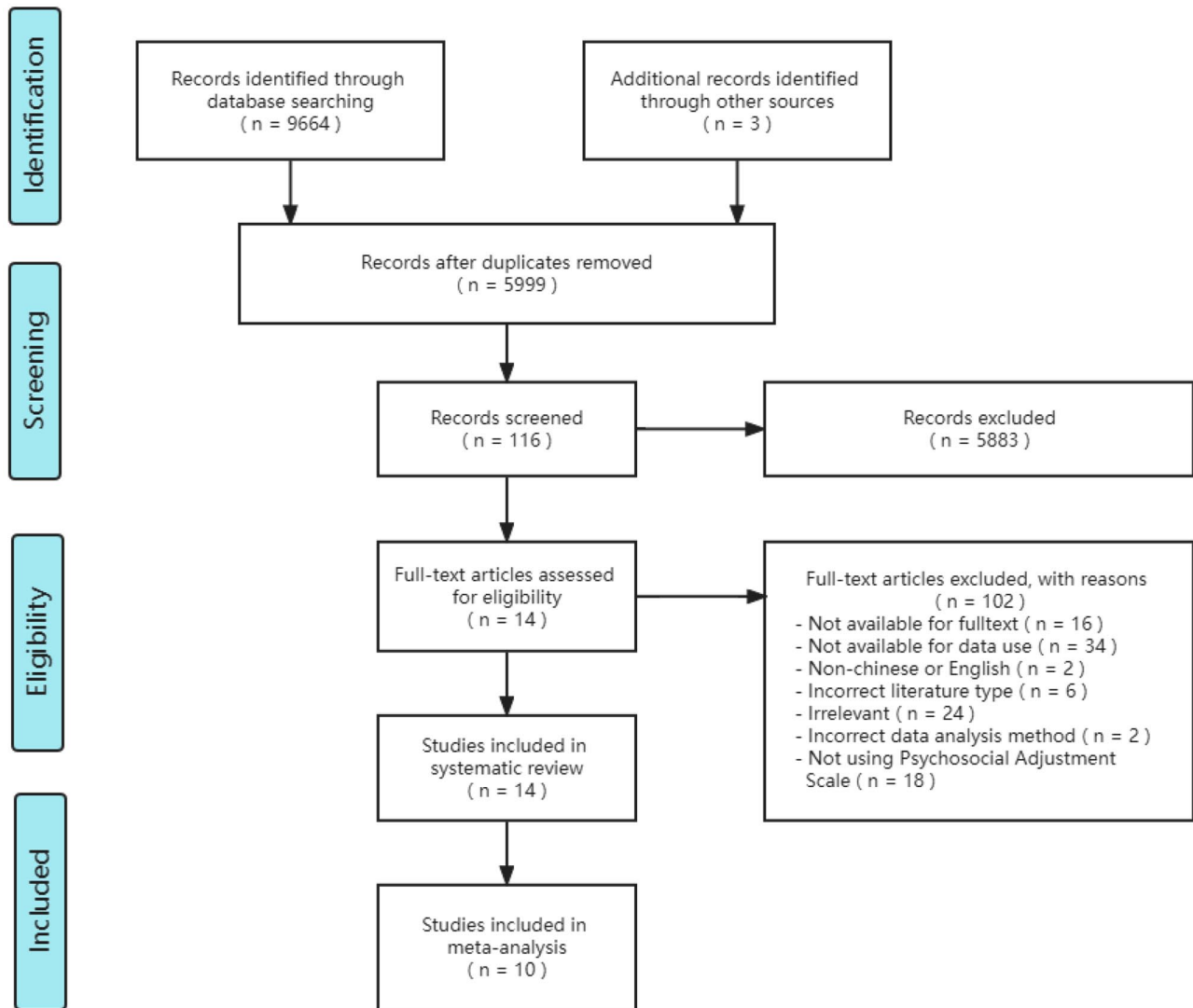


Figure 1. Literature screening process.

After entering 14 pieces of literature data individually, the chi-square test and P value were used to analyze and judge the heterogeneity. If $P \geq .1$ and $I^2 < 50\%$, it was designated that the statistical heterogeneity among the studies was not evident, and the fixed effect model can be used for combined analysis. If $P < .1$ and $I^2 \geq 50\%$, it shows that the heterogeneity was significant. Initially, we analyzed the specific sources of heterogeneity. If there was no apparent clinical heterogeneity among the studies, we used the random effect model for merger analysis. However, if the heterogeneity was apparent, we considered subgroup analysis or sensitivity analysis, or we abandoned the combination and used descriptive analysis instead.

Results

Literature retrieval results

Nine thousand six hundred sixty four related literature were initially retrieved, and 3 related pieces of literature were

supplemented. Two researchers screened the literatures and finally included 14 literatures (Figure 1).¹³⁻²⁶ 10 articles were meta-analyzed.^{13-19,21,22,24,26} The PRISMA flow diagram of the study selection procedure were summarized in Figure 1.

Study characteristics

Among the 14 papers included, 9 were in English, and 5 were in Chinese. Additionally, these articles were published from 1991 to 2021. The primary characteristics of the papers are shown in Table 1.

Literature quality evaluation results

All 14 papers used in this analysis were cross-sectional studies. The quality scores of all studies range from 10 to 16 points, and the evaluation results of literature quality are shown in Tables (Table 2).

Table 2. Evaluation of literature quality included in literature.

EVALUATION PROJECT	LIU KEHUA 2021	LAN JIE 2019	SHEN AOMEI 2017	ZHANG RUIQIN 2021	SHEN AOMEI 2017	WESTBROOK 2005	BARTON M A 2001	MAZANEC SR 2011	TAGHADOSI M 2017	GOTCHER J M 2001	LI OC 2012	SANEHA C 2000	GUMUS AB 2011	TAGHADOSI M 2017
1. Are the inclusion criteria of research objects clearly defined?	Y	Y	Y	Y	Ys	Y	Y	Y	Y	Y	Y	Y	NC	Y
2. Do you describe the research objects and research sites in detail?	Y	Y	Y	Y	Y	NC	Y	Y	Y	Y	Y	Y	Y	Y
3. Is there an effective and credible method to evaluate exposure factors?	NC	NC	NC	NC	Y	NC	Y	Y	Y	Y	Y	Y	Y	Y
4. Are objective and standard methods used to assess health problems?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
5. Are confounding factors identified?	N	N	Y	N	Y	Y	Y	Y	N	Y	N	Y	N	N
6. Have measures been taken to control the confounding factors?	N	N	Y	N	Y	Y	Y	Y	N	Y	Y	Y	NC	N
7. Is there an effective and credible method to evaluate the outcome index?	NC	NC	Y	NC	Y	NC	Y	Y	NC	Y	Y	Y	Y	NC
8. Is the data analysis method appropriate?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NC	Y	Y	Y
Total scores	10	10	15	10	16	13	16	16	11	16	13	16	12	11

Table 3. Meta-analysis results of influencing factors of psycho-social adaptation of people with cancer.

INFLUENCING FACTORS	NUMBER OF REFERENCES	I^2 (%)	META ANALYSIS MODEL	FISHER'S Z (95%CI)	SUMMARY R VALUE	P VALUE
Age	3	0.0	Fixed	-0.21 [-0.31, -0.10]	-.21	<.001
Uncertainty of disease	2	98.0	Random	0.90 [0.02, 1.78]	.72	.040
Confrontation coping strategy	2	25.0	Fixed	-0.55 [-0.62, -0.49]	-.50	<.001
Avoidance coping strategy	2	93.0	Random	0.35 [0.02, 0.68]	.34	.040
Acceptance coping strategy	2	88.0	Random	0.42 [0.17, 0.67]	.40	.001
Emotion-oriented coping	2	91.0	Random	0.43 [0.03, 0.83]	.41	.04
Hope	2	70.0	Random	-0.53 [-0.65, -0.41]	-.49	<.001
Pain	2	0.0	Fixed	0.93 [0.79, 1.06]	-.73	<.001
Self-efficacy	3	50.0	Random	-0.57 [-0.69, -0.46]	-.52	<.001
Education	2	0.0	Fixed	-0.19 [-0.31, -0.07]	-.19	.002
Social support	3	0.0	Fixed	-0.44 [-0.49, -0.38]	-.41	<.001

Analysis of related factors affecting psychosocial adaptation of cancer patients

Meta-analysis results are shown in Table 3 and the theoretical model of influencing factors and mechanisms of psychosocial adaptation of cancer patients constructed in this study are shown in Figure 2. The detailed analysis is as follows.

Physiological factor. Five of the 14 papers included^{19-21,24,25} the influence of physiological factors were analyzed. Eight factors were extracted, including the course of the disease, disease severity, treatment mode (radiotherapy, operation), postoperative time, complications, symptom distress, post-traumatic stress symptoms, and cognitive evaluation (threat cognition, injury cognition). Psychosocial adaptation of cancer patients was negatively correlated with post-traumatic stress symptoms, treatment methods, symptom distress, disease severity, course of the disease, and cognitive evaluation (threat cognition and injury cognition). Furthermore, we found positive correlations of psychosocial adaptations with complications and postoperative time. Meta-analysis was not performed for each factor in this study since only 1 literature was included in the study for each factor.

Personal Factor. Of the 14 pieces of literature included, 11 involved individual studies,^{13-15,17-22,24,26} and 14 influencing factors were extracted. Among them, 3 pieces of literature^{19,21,24} analyzed the influence of age on the psychosocial adaptation of cancer patients. Heterogeneity was observed ($P=.73$) with inconsistency (I^2) of 0%, which was analyzed using a fixed-effect model. Meta-analysis results show a positive correlation between age and psychosocial adaptation level [$r=-.2070$, Fisher's $Z=-0.21[-0.31, -0.10]$, $P<.0001$] (Figure 3).

Three papers^{13,15,21} analyzed the influence of self-efficacy on the psychosocial adaptation of cancer patients. Heterogeneity was observed ($P=.13$) with inconsistency (I^2) of 50%, and the random effect model was used for analysis. The combined results show a positive correlation between self-efficacy and psychosocial adaptation [$r=-.5154$, Fisher's $Z=-0.57[-0.69, -0.46]$, $P<.0001$] (Figure 4).

Two studies^{13,15} analyzed the relationship between psychosocial adaptation and coping styles of facing, avoidance, and yield. The combined results showed that facing was positively correlated with psychosocial adaptation [$r=-.5005$, Fisher's $Z=-0.55[-0.62, -0.49]$, $P<.0001$], avoidance [$r=.3364$, Fisher's $Z=-0.35[0.02, 0.68]$, $P=.04$] and yield [$r=.3969$, Fisher's $Z=0.42[0.17, 0.67]$, $P=.004$] were negatively correlated with psychosocial adaptation. Among them, the heterogeneity were observed in avoidance ($P=.0001$) with inconsistency (I^2) of 93% and in yield coping ($P=.004$) with inconsistency (I^2) of 88%, which were analyzed using the random effect model. Further analysis of heterogeneity sources included 1 of the 2 studies with 174 patients with intestinal cancer¹³ and another with 817 patients with breast cancer during chemotherapy.¹⁵ Considering that it may be related to the different study populations and large differences in sample size included in the 2 studies (Figures 5-7).

In addition, 2 pieces^{18,24} of the literature analyzed the relationship between emotion-oriented coping and psychosocial adaptation. Heterogeneity was observed ($P=.001$) with inconsistency (I^2) of 91%. This may be related to the different measurement tools used in the study, so the random effect model was used for analysis. After combining the results, we identified a negative correlation between emotion-oriented coping and psychosocial adaptation levels [$r=.4053$, Fisher's $Z=0.43[0.03, 0.83]$, $P=.04$] (Figure 8).

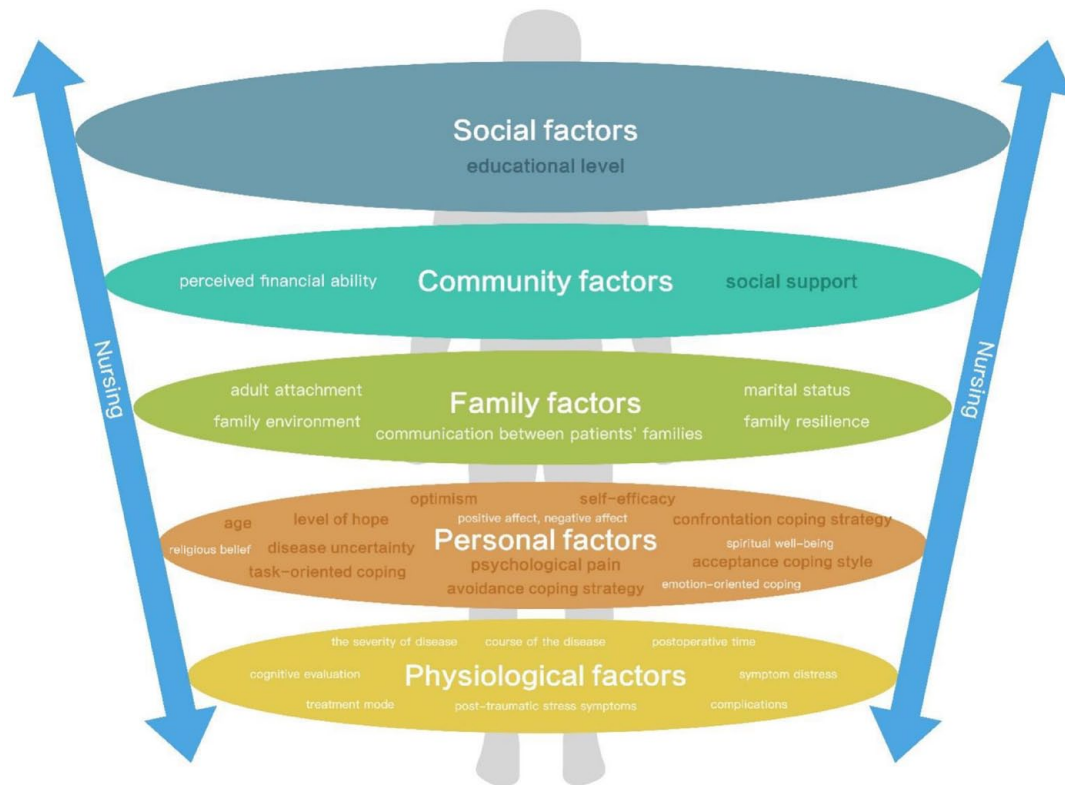


Figure 2. Preliminary theoretical model of influencing factors and mechanism of psycho-social adaptation of people with cancer.

Two studies^{14,21} analyzed the influence of disease uncertainty on psychosocial adaptation. Heterogeneity was observed ($P < .00001$) with inconsistency (I^2) of 98%, and the random effect model was used for analysis. Our results showed a negative correlation between disease uncertainty and psychosocial adaptation [$r = .7163$, Fisher's $Z = 0.90$ [0.02, 1.78], $P = .04$] (Figure 9).

Two studies^{15,17} analyzed the hope level, and the heterogeneity was observed ($P = .07$) with inconsistency (I^2) of 70%, which was analyzed using the random effect model. Our results showed a significant positive correlation between hope level and psychosocial adaptation [$r = -.4854$, Fisher's $Z = -0.53$ [-0.65, -0.41], $P < .00001$] (Figure 10).

Two other papers^{18,26} investigated the effects of psychological distress, and the heterogeneity was observed ($P = .96$) with inconsistency (I^2) of 0% when analyzed using the fixed effect model. Meta-analysis showed a significant negative correlation between psychological distress and psychosocial adaptation [$r = -.7306$, Fisher's $Z = 0.93$ [0.79, 1.06], $P < .00001$] (Figure 11). After stratifying the literature by removing some of the articles and using a sensitivity analysis and Meta-analysis, we found that the conclusion was consistent before elimination with high stability.

In addition, 1 study showed that optimism,¹⁸ task-oriented coping,¹⁸ positive effect,²⁰ religious belief,²² and mental well-being²⁵ were positively correlated with the psychosocial adaptation level of cancer patients, while negative effect²⁰ was

negatively correlated with the psychosocial adaptation level of cancer patients.

Family factor. At the level of family factors, 5 related factors were summarized, including marital status, family resilience, adult attachment, family environment, and communication between patients' families. Five pieces of literature that involved these factors^{16,18,19,23,24} were included in this study, and only 1 literature was included in the study for each factor. Therefore, meta-analysis was not carried out with these articles. Among them, marital status was found to be negatively correlated with psychosocial adaptation; family resilience, family environment, and communication between patients' families were positively correlated with psychosocial adaptation. In terms of communication with family members, the support provided by family members helps alleviate the isolation experienced by patients during the course of their illness. Couples play an important role in the recovery, care and assistance of a sick loved patient.²⁷ Collectively, these familial factors correlated with better psychosocial adaptations for cancer patients. Furthermore, another study²⁸ analyzing adult attachment showed that avoidance and anxiety attachment in an intimate relationship were negatively correlated with the psychosocial adaptation of cancer patients.

Community factor. Community factors refer to the community built environment, structure, diversity, social capital, and social support that affect individuals differently. There are 4 pieces of

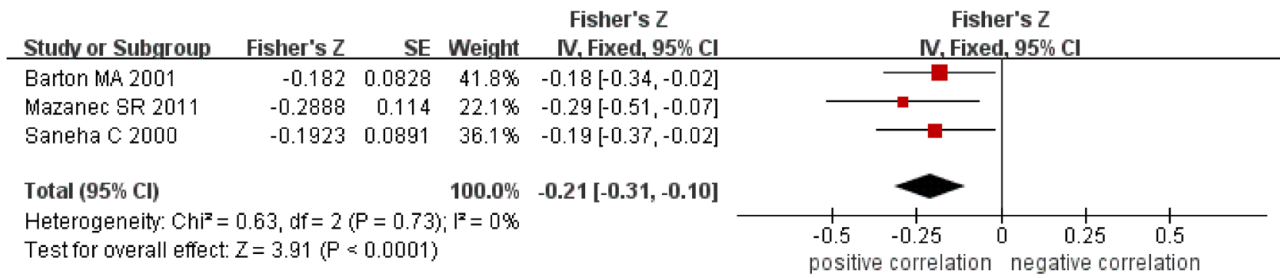


Figure 3. Influence of age on psycho-social adaptation.

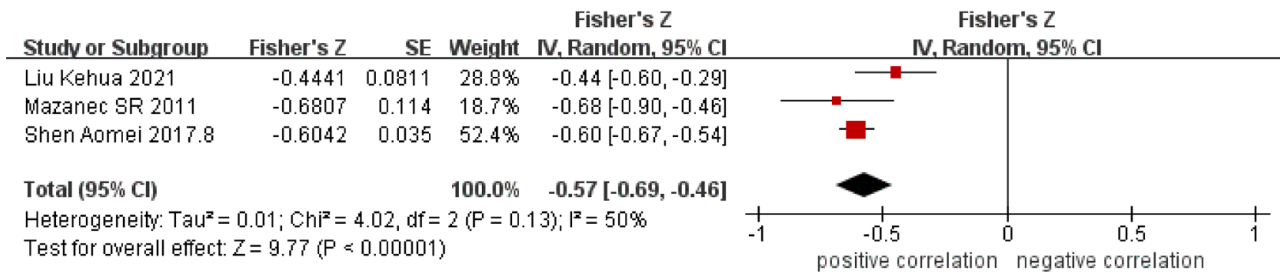


Figure 4. Influence of self-efficacy on psycho-social adaptation.

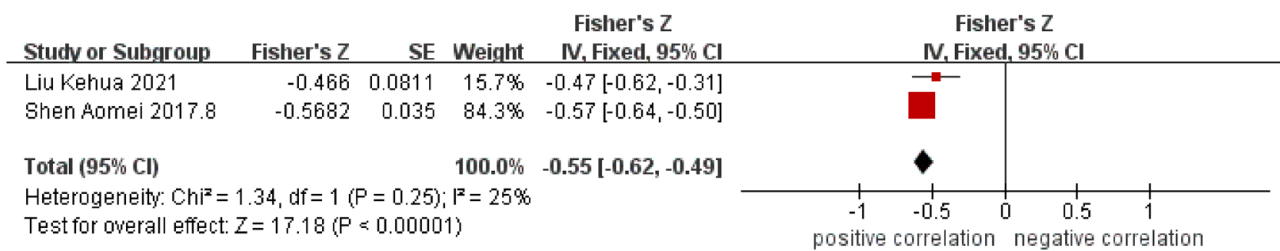


Figure 5. Influence of facing coping strategy.

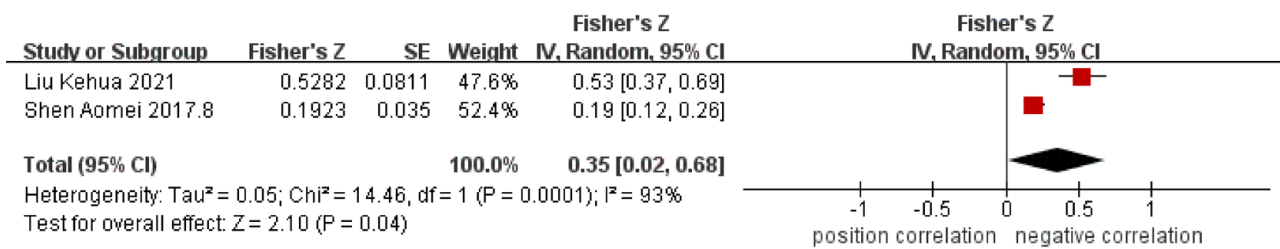


Figure 6. Influence of avoidance coping strategy.

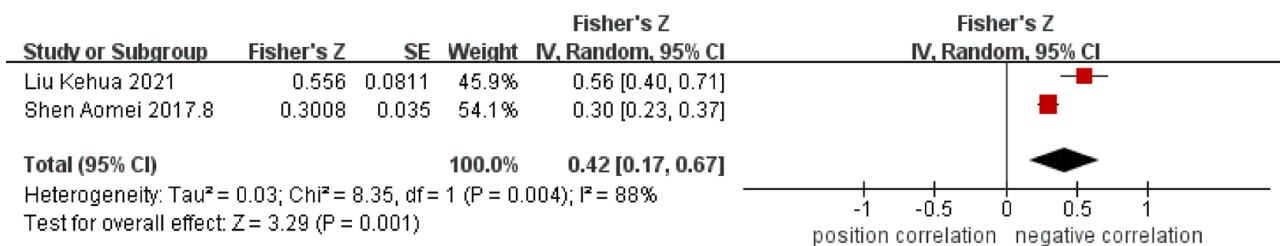


Figure 7. Influence of yield coping style.

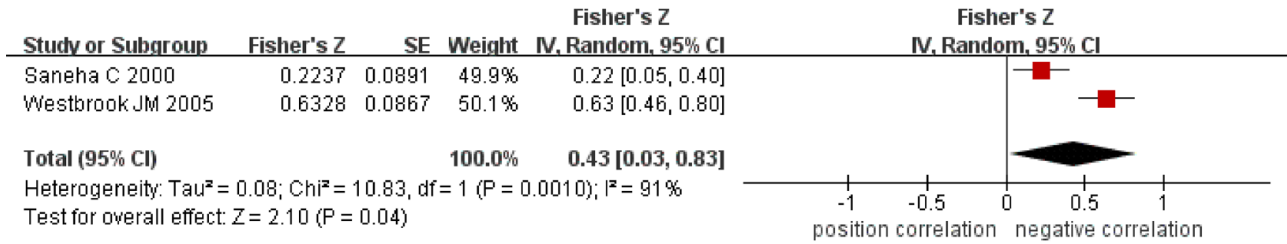


Figure 8. Influence of emotion-oriented coping on psycho-social adaptation.

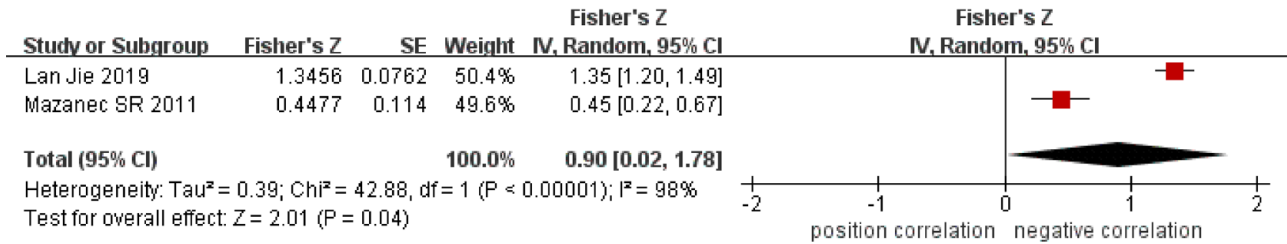


Figure 9. Influence of disease uncertainty on psycho-social adaptation.

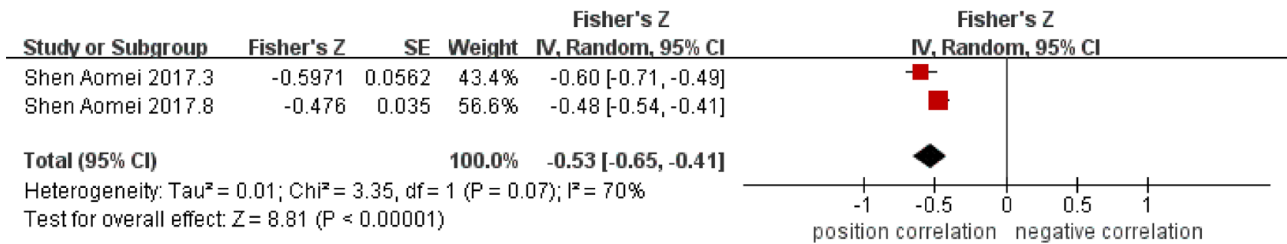


Figure 10. Influence of hope on psycho-social adaptation.

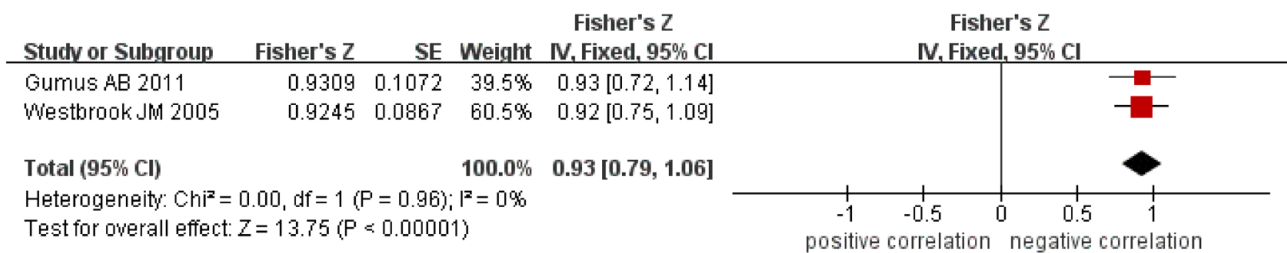


Figure 11. Influence of psychological distress on psycho-social adaptation.

literature related to community factors, and 1 study²⁴ showed a positive correlation between cancer patients' perceived financial ability and their psychosocial adaptation level. Three studies^{15,16,21} analyzed the influence of social support on the psychosocial adaptation of cancer patients. After combining the results, the heterogeneity was observed (P=.56) with inconsistency (I²) of 0%. Therefore, the fixed effects model was adopted. Meta results showed a positive correlation between social support and psychosocial adaptation of cancer patients [r=-.4136, Fisher's Z=-0.44 [-0.49, -0.38], P<.001] (Figure 12). Sensitivity analysis was performed, and all the results were very stable and reliable.

Social factor. Social factors include natural ecosystems, environment, education, occupation, gender, race, and so on. At the social level, only 1 influencing factor was extracted: education level. Two papers^{19,24} analyzed the influence of educational level on the psychosocial adaptation of cancer patients, and the heterogeneity was observed (P=1.00) with inconsistency (I²) of 0%, so the fixed effects model was used for analysis. Meta-analysis showed that there was a positive correlation between educational level and psychosocial adaptation (r=-.1877, Fisher's Z=-0.19 [-0.31, -0.07], P=.002) (Figure 13).

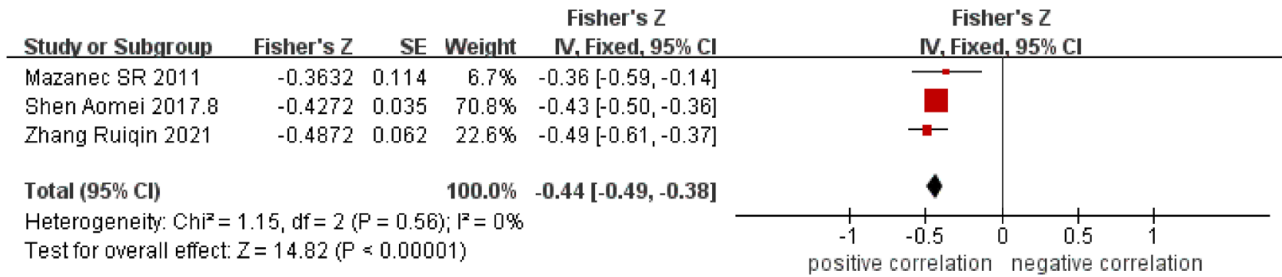


Figure 12. Influence of social support on psycho-social adaptation.

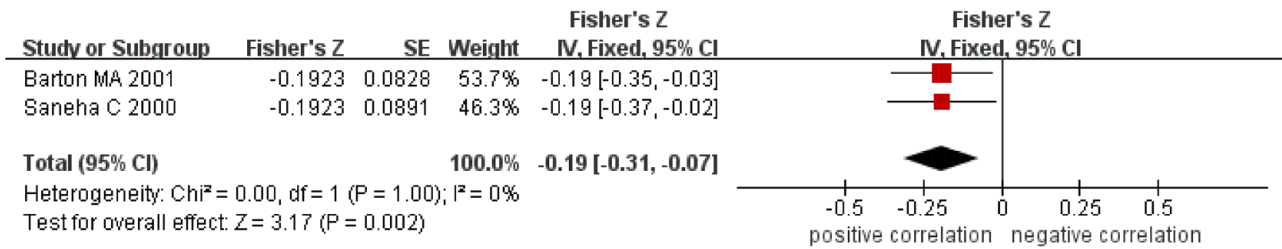


Figure 13. Influencing of education level on psycho-social adaptation.

Discussion

Cancer adaptation refers to the individual's response to various complex problems during cancer survival, including physical adaptation, psychological adaptation and social adaptation, among which the psychosocial adaptation to cancer deserves special attention. Since it not only affects the quality of life and survival of the individual, but also affects the well-being of the whole family and even the health of the society. In the long period of coexist with cancer, the question of how to make great psychosocial adaptation to successfully adapt to the disease is crucial. Therefore, this systematic review guided by the social-to-cells resiliency model, investigated, and integrated the influencing factors of psychosocial adaptations for cancer patients at home and abroad. Patients in different age groups have different psychosocial demands. Young patients diagnosed with malignant tumors often assume variety of roles and responsibilities in the workplace and family, which poses great challenges for their development, work, family, and other aspects of daily living.²⁹ Compared to older patients, younger patients lack specific life experiences, have poor stress resistance and buffer ability when coping with challenges, and cannot adapt sufficiently to a series of changes induced by cancer. Therefore, the diagnosis and treatment of younger cancer patients can severely impact their physical and mental health, leading to poor psychosocial adaptation levels. Similarly, Minahan³⁰ confirmed that with increased age, the body and mind are constantly maturing, the values and beliefs are constantly reshaped, and the life experience is constantly accumulating so that they can better adapt to stressful situations events, with less pressure and better psychosocial adaptation. Therefore,

clinical medical staff must evaluate cancer patients' specific needs and psychosocial adaptation at different ages and give targeted support and intervention.

Hope is an individual's internal motivation and an incentive factor to initiate or maintain actions to achieve goals. It is imperative to discover the meaning of life and unity and improve self-evaluation and self-worth. These developed factors can neutralize the impact of stress on the individual's physical and mental health and help them better adapt to challenges.³¹ This study showed that the better the level of hope for the patients, the better their psychosocial adaptation level. Similarly, Peh³² found that hope is a protective factor of positive psychological adaptation, which can improve patients' happiness level and psychosocial adaptation by reshaping patients' misrecognition and regulating cognitive evaluation. Self-efficacy is a subjective judgment on whether one can successfully achieve a specific goal. In other words, confidence and belief in whether one can successfully achieve behavioral goals or achievements³³ are essential in maintaining motivation and goal-oriented behavior.²⁸ The results of this study showed that a higher level of self-efficacy correlates with a better psychosocial adaptation for cancer patients, which is consistent with the research results of Rottman.³⁴ The reason for this may be that patients with higher self-efficacy may adopt positive ways to address the challenges of cancer and have more self-confidence to cope with stress. Similarly, Nam³⁵ investigated the psychosocial adaptation of 125 enterostomy patients in Korea, showing that self-efficacy is the main predictor of reducing symptom burden and promoting psychosocial adaptation. Therefore, clinical staff should take corresponding intervention measures

to stimulate the improvement of cancer patients' hope level and self-efficacy in a more active way to better promote their better adaptation.

Coping is a mode of stress management.³⁶ At different stages of the disease, the process and status of psychosocial adaptation of cancer patients largely depend on their ability to adopt different coping styles to deal with sudden or emerging problems throughout the disease.³⁷ This study showed that patients who adopt face-to-face coping styles have better psychosocial adaptations when dealing with cancer-related events. However, more patients who adopt avoidance, submission, or emotion-oriented coping style have poor psychosocial adaptations. Macía P³⁸ studied 170 cancer patients and reached a similar conclusion: adaptive coping style and behavior are protective factors for the mental health of cancer patients. From this analysis, it may be because cancer patients who adopt a more active coping style will likely also adopt a more positive attitude toward the disease, seek more information and social support, deal with various events in different ways, better adjust to the impact of difficulties brought by diseases on individuals, families, work, and better adjust their emotional responses to adapt to diseases.³⁹ In contrast, avoiding or succumbing to various difficulties brought about by diseases or patients who adopt emotion-oriented coping strategies are faced with the difficulties and challenges resulting from cancer and cannot respond effectively. These types of coping styles usually result in a negative cognition of diseases, a series of negative emotions such as anxiety, depression, despair, potential loss of self-control, confidence, and hope for life, which usually makes cancer patients have a greater psychological burden and hinders the process of their psychosocial adaptation.⁴⁰ However, some studies have shown that a negative coping style does not only play a detrimental role.^{41,42} In terms of short-term benefits, avoidance and submission can also alleviate the tremendous pressure of acute stress events on individuals, give patients sufficient buffer and acceptance time to further reflect and reshape their cognition, and seek ways and methods to solve problems to better adapt to the challenges brought by diseases. It is suggested that different coping styles play different roles in patients with different characteristics and different stages of diseases. Medical staff should give targeted guidance according to clinical practice and different individual situations to help them use appropriate coping strategies to better adapt to the challenges brought by diseases.

The results of this study showed that a strong level of disease uncertainty and psychological pain would significantly reduce the psychosocial adaptation of cancer patients. Similarly, Ghodraty⁴³ showed that disease uncertainty was an essential factor affecting cancer patients' quality of life and disease adaptation. A high level of disease uncertainty may occur at every stage of the patient's diagnostic treatment. They are constantly in negative emotions and psychological pains such as anxiety, depression, and fear.⁴⁴ They are more inclined to adopt

negative coping strategies such as avoidance to deal with the stress brought by cancer, making it difficult for them to adapt to the disease's impact on their physical and mental health and further reducing their health-related quality of life.⁴⁵ In addition, psychological pain and negative psychology will directly reduce the adaptation level of cancer patients.⁴⁴ Negative thinking and negative emotions will bring heavy psychological pressure to patients.⁴⁶ The disease impacts the patients' lives, work, families, and other aspects can often cause cancer patients to feel worried, anxious, fearful, desperate, and try to adopt a pessimistic attitude and passive way to face the disease. In doing so, this will further lead to their inability to identify effective ways to cope with and adapt to the stress brought by cancer, resulting in poor psychosocial adaptation.⁴⁷ Therefore, medical staff should pay attention to evaluating the psychological status of cancer patients and give individualized guidance according to the physical and mental characteristics and adaptation status of different individuals.

This study showed that good social support can improve the psychosocial adaptation of cancer patients. Similarly, Janowski⁴⁸ pointed out that the social support system of breast cancer patients has a direct and positive impact on their psychosocial adaptation. A study on early breast cancer⁴⁹ also found that the higher the social support patients feel, the better their coping ability and psychosocial adaptability. In addition, a studies⁴⁴ found that social support had a positive impact on the psychosocial adaptation of cancer patients, and the degree of impact was different at different stages of the disease, especially for patients who are expected to live within 5 years. Social support is the primary intermediary factor of psychological stress, which can enhance the ability and confidence of individuals to tolerate, cope, and free themselves of tension and negative emotions. Thus, reducing the psychological stress reaction of patients after an operation and promoting their psychosocial adaptation.⁵⁰ Therefore, clinical staff should do an adequate job evaluating the patients' overall social support. When assessing the social support system, staff can help patients develop a personalized social support system involving medical staff, families, and friends according to patients' disease stages to enhance their awareness of seeking social support and help them cope with difficulties.

We found that the higher the education level, the better the psychosocial adaptation of the patients. A higher education level helps patients use a more comprehensive range of information channels to obtain relevant medical information knowledge and resources and transform them into techniques and conditions for solving stressful events.⁵¹ Consistent with the findings of previous studies, low education levels lead to low cancer treatment success.⁵² However, some studies have indicated that there is no correlation between education level and cancer knowledge scores.⁵³ A higher level of education does not mean that patients have more and accurate knowledge of medical information. Meanwhile, higher education level is associated

with higher perception of the burden of disease.⁵⁴ Therefore, the relationship between education level and psychosocial adjustment needs to be further verified by follow-up studies.

There is a lack of research involving the cellular level. The cellular level refers to the way in which prevention, diagnosis and treatment can be precisely tailored to each individual from the molecular level, based on biological characterization.⁵⁵ The cellular level serves as the biological basis for adapting to environmental changes through mechanisms such as DNA repair, mitochondrial function, oxidative stress response, epigenetics, and cellular senescence. It enables the development of precise care plans for the individual and the continuous optimization of the care process to better meet individualized patient needs and improve the quality of care.⁵⁶ Few studies have been conducted at this level, which can be subsequently combined with precision nursing as a trend of future research.

Study Limitations

This study had several limitations. All the studies included in this study were cross-sectional studies, which may be less reliable than cohort and case-control studies. Compared with large sample sizes medical studies, the internal and external validity of studies with small samples were often weakened. Thirdly, this studied was limited to data available in English-language or Chinese-language studies, thus cancer patients from different ethnic, cultural and linguistic diversity backgrounds were not represented, which may potentially affect patients' psychosocial adaptation. There were many research tools for measuring psychosocial adaptation. This study limited the use of the Psychosocial Adjustment to Illness Scale (PAIS) and unified the data analysis method, but there may be some gaps in the results of using other research tools. The society-to-cells model stated that the cellular level, as the biological basis, could adapt to different changes through DNA repair, mitochondrial function, oxidative stress response, epigenetic inheritance, cell senescence and other mechanisms. However, the studies included in this study lacked medical research involving the cellular level, which meant that studies on understanding the psychosocial adaptation of cancer patients from the perspective of basic medicine are lacking and not thorough enough. Different cancers have unique influencing factors, and this study was conducted for all cancers, without limiting the type of cancer. Whether these factors are effective for all cancers needs to be verified in specific populations. Despite these limitations, this is the first systematic review and meta-analysis based on the society-to-cells model to comprehensively and systematically explore the influencing factors of psychosocial adaptation in cancer patients.

Conclusion

This study aimed to systematically review research on the influencing factors of psychosocial adaptations for cancer patients at home and abroad. As guided by the social-to-cells

resilience model, the psychosocial adaptation of cancer patients was influenced by physiology, individual, family, community, and societal factors. The most consistent influencing factors were age, education level, disease uncertainty, hope level, psychological distress, self-efficacy, social support, different coping styles. However, there was still a lack of related research at the cellular level. Cellular level factors can be a guide for subsequent precision care. In the future, it may be necessary to strengthen the research in basic medicine in this field and added studies including multi-center and extensive sample research are necessary to lay the foundation for clarifying the key factors affecting the psychosocial adaptation of cancer patients. Likewise, these added investigations would provide a basis for formulating a scientific, reasonable, and accurate intervention plan in the late-stage period for patients so that they may fully mobilize their external resources, modify cognitive concepts, adjust negative emotions. With the added support of clinical staff and the added understanding of the patients' support networks, we can better promote patients to cope with diseases, their overall outlook on life and better support them in improving their health-related quality of life.

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Author Contributions

All authors participated in the design of the studies and review of the manuscript; Conceptualization, Software, Formal analysis, Data Curation, Writing—Original Draft, Writing—Review & Editing, Visualization: [Hanjing Zhu]; Conceptualization, Writing—Original Draft, Editing and Revisions:[Linning Yang]; Writing—Original Draft:[Hongfan Yin]; Literature screening and data extraction:[Jia Gu]; Conceptualization, Editing and Revisions:[Xia Yuan]; Experimental Design Guidance and Funding Support:[Yan Yang]

Ethical Approval

The Ethics Committee of Shanghai Jiao Tong University Public Health and Nursing Research approved the study protocol, which was performed in accordance with the Declaration of Helsinki. All participants provided written informed consent.

Registration

This review study was preregistered with PROSPERO (CRD42021281291) https://www.crd.york.ac.uk/PROSPERO/display_record.php?RecordID=281291

A Data Availability Statement

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

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SUPPLEMENTAL MATERIAL

Supplemental material for this article is available online.

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