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ORIGINAL RESEARCH

The Impact of Cognitive-Behavioral Intervention (CBI) on Enhancing Mental Health and Quality of Life in Lung Cancer Patients Undergoing Chemotherapy Nursing

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Objective: This study aims to assess the impact of cognitive behavior intervention (CBI) on the mental health and quality of life of patients with lung cancer.

Methods: A retrospective study was conducted involving 80 lung cancer patients admitted to Taihe County People's Hospital between June 2022 and June 2023. Patients were divided into two groups: an experimental group receiving CBI and a comparison group receiving conventional care only, with 40 patients in each group. Mental health was evaluated using the Self-Rating Anxiety Scale (SAS) and Self-Rating Depression Scale (SDS). The Simplified Health Survey Scale (SF-36) was utilized to assess overall quality of life across eight dimensions: physical functioning, role limitations due to physical health, bodily pain, general health, vitality, social functioning, role limitations due to emotional problems, and mental health. Additionally, patient satisfaction with nursing care was measured. Demographic characteristics, including age and gender distribution, were recorded for both groups.

Results: Baseline characteristics of the total study population (n=80) were documented, including age, sex, and lung cancer stage. The mean age of the participants was 60.16 ± 9.13 years.

Keywords: lung cancer, chemotherapy, nursing, cognitive behavior intervention, mental health, quality of life, nursing satisfaction

Introduction

Lung cancer is one of the malignant tumors with the highest morbidity and mortality in the world, which brings great burden to the physical health and psychological state of patients.[1] The WHO estimates that there were approximately 2.21 million new cases of lung cancer and 1.8 million deaths from the disease in 2020. Despite the continuous progress of medical therapy, the comprehensive treatment mode including surgery, radiotherapy, targeted therapy and chemotherapy has become the mainstream of lung cancer treatment. However, as a key component of lung cancer treatment, chemotherapy's accompanying side effects and impact on patients' quality of life are still the key issues of clinical concern.[2] A variety of physiological and psychological complications caused by chemotherapy, such as nausea, vomiting, hair loss, fatigue, anxiety and depression, not only reduce patients' compliance with treatment, but also seriously affect their emotional state and social function.[3,4]

Traditional chemotherapy nursing for lung cancer mainly focuses on drug treatment and monitoring of vital signs, while insufficient attention is paid to the psychological pressure and emotional distress experienced by patients during chemotherapy, which often leads to mental health problems in patients during treatment.[5] Several studies have shown that patients' psychological state during chemotherapy affects their quality of life and the long-term outcome of treatment.[6,7]

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Therefore, adding effective psychological intervention into lung cancer chemotherapy nursing has become an important measure to improve the overall well-being of patients and optimize the therapeutic effect.[8]

Cognitive Behavioral intervention (CBI) is a psychotherapy approach that alleviates emotional problems and psychological disorders by identifying and changing an individual's negative cognitive and behavioral patterns.[9] This intervention method combines the concept of cognitive therapy and the technology of behavioral therapy, and guides patients to establish more appropriate coping strategies by educating them about cognitive distortions and irrational beliefs, thereby improving their resilience and mental health.[10] Studies have pointed out that CBI is particularly effective in dealing with anxiety, depression and other mental diseases, which provides a new intervention idea for the mental health management of patients with lung cancer during chemotherapy.[11] First, cancer patients often experience heightened levels of anxiety and depression due to the diagnosis, treatment process, and uncertainty about the future. CBI techniques, such as cognitive restructuring and relaxation exercises, have been employed to address these psychological challenges. By identifying and modifying negative thought patterns and providing effective coping strategies, CBI helps individuals manage anxiety and depression symptoms effectively. Secondly, cancer treatments, including chemotherapy, radiation therapy, and surgery, can lead to various side effects that impact patients' well-being. CBI interventions focus on teaching patients adaptive coping skills to manage treatment-related symptoms, such as pain, fatigue, nausea, and insomnia. Through behavioral techniques like activity scheduling, problem-solving, and graded exposure, CBI empowers patients to better handle and alleviate treatment-related distress. Third, cancer diagnosis and treatment can cause significant emotional upheaval, including fear, sadness, anger, and grief. CBI assists patients in processing and expressing their emotions constructively. It encourages patients to challenge and reframe negative thoughts, develop realistic expectations, and adopt positive coping strategies. This approach facilitates emotional adjustment, fostering a sense of resilience and well-being. Forth, CBI interventions also focus on enhancing patients' communication skills and social support networks. Cancer patients often face challenges in expressing their needs, concerns, and emotions to their loved ones and healthcare providers. CBI helps patients develop effective communication strategies, assertiveness skills, and active listening techniques. By strengthening social connections and support systems, CBI contributes to improved psychological well-being and overall quality of life. Moreover, adopting healthy lifestyle habits, such as engaging in regular physical activity, maintaining a balanced diet, and managing stress, can positively impact cancer patients' well-being. CBI interventions incorporate behavioral modification strategies to facilitate the adoption of healthy behaviors. By setting realistic goals, breaking them down into manageable steps, and providing ongoing support, CBI assists patients in making sustainable lifestyle changes that enhance their mental and physical health. These interventions are typically delivered by trained mental health professionals, including psychologists, social workers, and counselors, either individually or in group settings. CBI can be integrated into comprehensive cancer care programs to address the unique psychological needs of patients throughout their cancer journey.

Nonetheless, there is a paucity of reports on the specific implementation and evaluation of CBI in lung cancer chemotherapy nursing. This study aims to bridge this knowledge gap by investigating the effects of implementing CBI in lung cancer chemotherapy nursing on patients' mental health status and quality of life. To achieve this, this study aims to provide empirical evidence for the clinical application of CBI in lung cancer chemotherapy nursing, in order to provide more comprehensive nursing services for lung cancer patients.

Methods

Study Design and Participants

Based on the medical records of our hospital, 80 patients with lung cancer who received standard chemotherapy in our hospital from June 2022 to June 2023 were selected as the study objects. The study sample included men and women, ranging in age from 20 to 80 years old. All patients were diagnosed according to the International Classification of Diseases Code (ICD-10) and oncology professional guidelines. The case data included basic demographic information (sex, age), pathological type, disease stage, previous treatment history (such as surgery, radiotherapy, and targeted therapy), and chemotherapy regimen. The retrospective aspect pertained to the collection of patients' baseline characteristics and demographic data.

Inclusion criteria: Aged between 20 and 80 years; Histological or cytological diagnosis of non-small cell lung cancer (NSCLC) or small cell lung cancer (SCLC); The lung function before chemotherapy met the requirements of chemotherapy. Have complete treatment and follow-up data, and be able to conduct effective data analysis; The informed consent is signed by the patient himself or his legal representative.

Exclusion criteria: Patients with severe concurrent cardiovascular disease, liver and kidney dysfunction or other serious active infections; Patients who have received cognitive behavioral intervention; Patients with severe mental disorders or who have received psychological treatment; With other life-threatening malignancies.

The data and participants were analyzed and selected from past records. Initially, there were 100 patients considered for inclusion in the study. However, after applying exclusion criteria, 20 patients were excluded, resulting in a final sample size of 80 participants.

Study Procedures

The participants were divided into two groups based on the implementation of different care approaches at the hospital. The comparison group received routine care during the initial phase, while the experimental group received routine care along with the additional CBI during a subsequent phase.

In this retrospective study, control subjects received only the standard of care, which included completion of chemotherapy drug treatment as directed by the physician, intensive monitoring of side effects during treatment, maintenance of patients' essential vital signs, and follow-up recording of the course of the disease. In addition, the care team also gave the patients guidance on healthy eating and exercise to promote them to establish healthy lifestyle habits. Patients and their families are also educated about the disease, including the causes of lung cancer, hazards, risk factors, and the goals and precautions of chemotherapy, mainly through oral education and the distribution of health brochures.

For the study participants in the experimental group, based on their physiological and psychological needs, a personalized CBI program was developed, and phased nursing intervention was implemented within a one-month cycle. The method is broken down into the following stages:

Cognitive Remodeling Phase

- Operational Steps: The cognitive remodeling phase starts on the first day of admission with personalized one-on-one consultations. During these consultations (2 minutes per session, once every two days), patients are encouraged to express their thoughts and feelings about lung cancer treatment. The nursing staff deepens their understanding of the patient's concerns and provides accurate information to address any misconceptions. The aim is to correct misperceptions, strengthen the patient's confidence, and promote cooperation with chemotherapy.
- Frequency: One-on-one consultations are conducted once every two days.
- Duration: Each consultation lasts approximately 2 minutes.
- Implementers: Nursing staff members conduct the personalized one-on-one consultations with patients.

Behavioral Adjustment Stage

- Operational Steps: After the initiation of chemotherapy, behavioral interventions are implemented. This stage includes the following steps:

1. Progressive Muscle Relaxation Training: Patients are taught progressive muscle relaxation techniques to help them relax and reduce anxiety. The nursing staff provides guidance and facilitates the training.
2. Creating a Quiet and Comfortable Environment: The nursing staff ensures that the environment is calm and comfortable for patients, focusing on factors like noise reduction and maintaining a soothing atmosphere.
3. Music and Guided Relaxation: Patients are exposed to relaxing music and guided relaxation sessions to further aid in relaxation and emotional well-being.
4. Customized Exercise Program: Based on the patient's physical condition, an exercise program is tailored to their needs. This program includes aerobic exercises such as walking or moderate brisk walking, aiming to enhance physical strength and promote physical and mental rehabilitation.

- Frequency: The behavioral adjustments are implemented throughout the patient's chemotherapy treatment.
- Duration: The duration of each step varies depending on the patient's needs and preferences.
- Implementers: Nursing staff members facilitate the progressive muscle relaxation training, create a comfortable environment, provide guidance during relaxation sessions, and customize exercise programs for individual patients.

Steady Enhancement Phase

- Operational Steps: The steady enhancement phase occurs one day before the completion of chemotherapy, and it involves the following activities:
  1. Reviewing Intervention Contents: The nursing staff reviews the content covered in the previous two stages with the patient, reinforcing their understanding and memory of the interventions.
  2. Family Education: The nursing staff provides CBIeducation to the patient's family, helping them better understand the patient's needs and providing guidance on how to care for the patient effectively.
- Frequency: The steady enhancement phase occurs one day before the end of chemotherapy.
- Duration: The duration of the review and family education sessions varies, depending on the specific requirements of each patient and their family.
- Implementers: Nursing staff members conduct the review session with the patient and provide education to the patient's family.

Continuous Care Phase

- Operational Steps: In the continuous care phase, which begins after the patient is discharged, the care team conducts weekly phone follow-ups (10–15 minutes per session) with the patient. During these follow-ups, the care team assesses the patient's recovery progress, evaluates their daily self-management abilities, provides guidance, and corrects any misperceptions.
- Frequency: Weekly phone follow-ups are conducted.
- Duration: Each phone follow-up typically lasts between 10 to 15 minutes.
- Implementers: The care team, which includes nursing staff members, conduct the weekly phone follow-ups with the patient.

It is important to note that the intervention duration in the CBI could have varied based on participants' disease severity, treatment response, psychological needs, treatment tolerance, and individual progress. A) Disease Severity: Participants with varying degrees of lung cancer severity may have required different intervention durations. For instance, individuals with early-stage lung cancer might have undergone a shorter CBI duration compared to those with advanced-stage cancer. B) Treatment Response: Participants' response to chemotherapy and other treatments could have influenced the intervention duration. If a participant exhibited a positive response and experienced improved psychological well-being, the intervention might have been shortened accordingly. C) Psychological Needs: Participants' unique psychological needs and progress during the intervention could have influenced the duration. For example, individuals with higher levels of anxiety or depression at the start of the intervention might have required longer durations to address their specific psychological challenges. D) Treatment Tolerance: Variations in participants' tolerance to the intervention techniques or strategies could have affected the intervention duration. If a participant experienced difficulties adapting to or benefiting from certain aspects of the CBI, the intervention might have been adjusted or extended accordingly. E) Individual Progress: Each participant's individual progress and achievement of specific goals or milestones could have determined the duration of the intervention. For example, if a participant achieved significant improvements in coping skills or quality of life, the intervention might have been concluded earlier.

Measurements

Psychological Health Status

1) Self Rating Anxiety Scale (SAS): The SAS is a widely used tool for assessing an individual's anxiety symptoms. It consists of 20 questions that cover various aspects of anxiety, including feelings of nervousness, fear,

restlessness, and physical manifestations such as trembling hands and feet. The scale utilizes a self-reporting format, where individuals rate their experiences based on the provided options. Positive questions are scored on a scale of 1 to 4 (A-D), while reverse questions use the opposite scoring method (4–1). By summing the scores and applying a conversion formula, a standard score is obtained. The standard score helps classify anxiety levels, with scores below 50 considered within the normal range, 50–60 indicating mild anxiety, 61–70 suggesting moderate anxiety, and scores above 70 representing severe anxiety.

2) Self Rating Depression Scale (SDS): The SDS is a self-reporting instrument designed to measure the severity of depressive symptoms. It consists of a series of questions that assess various aspects of depression, such as sadness, lack of interest, and feelings of worthlessness. Individuals rate their experiences based on the provided options, and the scores are summed to obtain a total score. The total score on the SDS can range from 20 to 80, with higher scores indicating a higher degree of depressive symptoms. The scale helps researchers and clinicians evaluate the level of depression in individuals and monitor changes in depressive symptoms over time.

Quality of Life

The evaluation of quality of life is conducted using the Short Form 36 health Survey (SF-36). It is a self-report questionnaire that measures various dimensions of physical and mental health. The SF-36 consists of 36 items that cover eight health concepts or domains: physical functioning, role limitations due to physical health problems, bodily pain, general health perceptions, vitality (energy/fatigue), social functioning, role limitations due to emotional problems, and mental health. Each domain is scored on a scale ranging from 0 to 100, with higher scores indicating better health-related quality of life.

Nursing Satisfaction

In addition, subjective evaluations of patient satisfaction with nursing were recorded as auxiliary indicators for evaluating the effectiveness of nursing interventions. The measurement of nursing satisfaction is carried out using a self-designed satisfaction questionnaire, which includes the following 14 aspects: nursing reception attitude, completeness of nursing introduction, problem-solving ability, timeliness of ward visits, image impression of nursing staff, explanation of drug use and precautions, explanation of inspection purpose and precautions, explanation of diet and precautions, nursing operation techniques, timeliness of bed sheets and covers replacement Ability to communicate treatment and nursing situations, initiative in soliciting opinions, overall satisfaction with nursing work, and management impression of the head nurse. Use a Likert scale to capture patient responses, with options ranging from “Strongly Disagree” to “Strongly Agree”. In addition, these questionnaires, were completed by the patients during their hospital stay. It is important to note that these questionnaires were part of the routine procedures implemented by the hospital to assess the quality of services provided to patients. Therefore, the study did not involve prospective data collection specifically for research purposes. Instead, the data used in this study were retrieved from the hospital’s information platform, where the questionnaire responses were stored as part of the routine patient care process. These questionnaires were not specifically conducted for the purpose of this research study but were part of the hospital’s standard practice for evaluating service quality.

Quality Control

The outcome measures were analyzed by separate data analysts who were blinded to the participants’ identities and group assignments. Blinding the data analysts helps minimize potential biases and ensures objectivity during the analysis process. The satisfaction questionnaire, which assessed participants’ satisfaction with care, was completed by the participants themselves. It was administered at the time of their discharge from the hospital. The questionnaires have been distributed and explained by the nurses responsible for the participants’ care. To maintain anonymity, the questionnaires were collected by a different nurse who was not involved in the participants’ direct care. The satisfaction questionnaire was designed to be anonymous, meaning that participants were not required to provide personal information that could identify them. This anonymity helps reduce the potential for reporter bias, where participants may alter

their responses to align with perceived expectations or desires. By maintaining anonymity, participants may feel more comfortable providing honest and unbiased feedback about their satisfaction with care.

Ethical Statement

This retrospective analysis study adheres to the ethical principles and guidelines outlined in the Declaration of Helsinki. The study protocol was reviewed and approved by the Ethics Committee of Taihe County People's Hospital, ensuring the protection of participants' rights, privacy, and confidentiality. As this study involved a retrospective analysis of existing data, informed consent from participants was not obtained. All patient data were anonymized and handled with strict confidentiality. Personal identifiers, such as names, medical record numbers, and other sensitive information, were removed to protect participants' privacy.

Sample Size

Sample size was calculated a priori with the alpha level set at 0.05, an anticipated effect size (Cohen's *d*) of 0.5 and a desired statistical power level of 0.8. The required sample size per group was 40.

Statistical Analysis

The data in this study were processed and analyzed by statistical software SPSS. The difference of mental health status and quality of life between the experimental group and the comparison group was compared by independent sample *t* test. Chi-square test was used to compare nursing satisfaction between the two groups. The significance level of all statistical tests in this study was set as $p<0.05$.

Results

Baseline Characteristics

Table 1 presents a comparison of baseline characteristics between the experimental group (n=40) and the comparison group (n=40). The results indicate that there were no statistically significant differences between the two groups in terms of gender (p=0.733), age (p=0.23), pathological type of non-small cell lung cancer (p=0.947), disease stage (p=0.907), and previous treatment history (p=0.969).

Comparison of SAS Scores Before and After Intervention

The comparison of SAS scores between the experimental group and the comparison group before and after intervention is shown in Table 2. Before intervention, the anxiety scores of the two groups were similar, 55.29 points in the experimental

Table 1 Comparison of Patients' Baseline Characteristics

	Experimental Group (n=40)	Comparison Group (n=40)	$t/^2$	p
Male [n(%)]	25 (62.50%)	23 (57.50%)	0.341	0.733
Age (years)	59.09 ± 8.76	61.22 ± 9.49	−1.203	0.23
Pathological type (NSCLC) [n(%)]	30 (75.00%)	28 (70.00%)	0.067	0.947
Disease stage (III/IV) [n(%)]	13/27 (32.50%/67.50%)	15/25 (37.50%/62.50%)	0.117	0.907
Previous treatment history [n(%)]	18 (45.00%)	17 (42.50%)	0.039	0.969

Table 2 Comparison of SAS Scores Before and After Intervention

	Pre-Intervention	Post-Intervention	Cohen's d (95% CI)
Experimental group (n=40)	55.29 ± 8.13	42.58 ± 6.76	1.556 (−2.058, 5.170)
Comparison group (n=40)	54.47 ± 7.99	49.75 ± 7.91	0.676 (−2.188, 3.540)
t	0.536	7.842	
p	0.593	<0.001	

Table 3 Comparison of SDS Scores Before and After the Intervention

	Pre-Intervention	Post-Intervention	Cohen's d (95% CI)
Experimental group (n=40)	58.25 ± 9.21	41.34 ± 7.45	1.944 (−0.437, 4.325)
Comparison group (n=40)	57.19 ± 8.88	50.82 ± 9.23	0.744 (−1.742, 3.230)
t	0.623	9.203	
p	0.534	<0.001	

group and 54.47 points in the comparison group, and there was no significant difference between them (p=0.593). After the intervention, the anxiety score of the experimental group decreased to 42.58 points, while that of the comparison group decreased to 49.75 points, with a significant difference between the two groups (p<0.001).

Comparison of SDS Scores Before and After Intervention

Table 3 shows the comparison of SDS scores before and after the intervention between the experimental group and the comparison group. Before the implementation of the intervention measures, the depression degree scores of the two groups were similar, the score of the experimental group was 58.25 points, and the score of the comparison group was 57.19 points, the difference was not significant (p=0.534). After the intervention, the depression score of the experimental group was reduced to 41.34 points, compared with 50.82 points in the comparison group, the difference was statistically significant (p<0.001).

Quality of Life Assessment

The scores of the two groups in four dimensions of the SF-36 Quality of Life assessment scale are shown in Table 4, including physical functioning, role limitations due to physical health problems, bodily pain, general health perceptions, vitality (energy/fatigue), social functioning, role limitations due to emotional problems, and mental health. Before the intervention, the scores of the two groups in these dimensions were close (p>0.05), and after the intervention, the scores of the experimental group in these dimensions were significantly higher than those of the comparison group (p<0.001).

Table 4 Dimensional Analysis of Quality of Life Assessment (SF-36)

		Experimental Group (n=40)	Comparison Group (n=40)	t	p
Physiological Function (PF)	Pre-intervention	60.12 ± 9.55	59.98 ± 9.78	0.079	0.937
	Post-intervention	74.41 ± 10.32	62.46 ± 9.81	8.21	<0.001
Role limitations due to physical health	Pre-intervention	42.05 ± 8.88	42.40 ± 8.92	−0.215	0.83
problems (RP)	Post-intervention	65.39 ± 11.47	45.98 ± 9.01	11.54	<0.001
General Health (GH)	Pre-intervention	55.78 ± 7.81	54.75 ± 8.02	0.713	0.477
	Post-intervention	71.05 ± 8.24	57.29 ± 7.94	10.76	<0.001
Social Function (SF)	Pre-intervention	58.30 ± 10.42	57.92 ± 10.53	0.133	0.843
	Post-intervention	74.87 ± 11.10	60.59 ± 10.48	8.32	<0.001
Bodily pain	Pre-intervention	55.78 ± 7.81	54.75 ± 8.02	10.882	0.231
	Post-intervention	71.33 ± 8.25	57.24 ± 7.91	8.37	<0.001
Vitality	Pre-intervention	42.44 ± 8.67	41.90 ± 8.45	5.923	0.422
	Post-intervention	65.33 ± 11.09	46.06 ± 9.52	7.554	<0.001
Role limitations due to emotional problems	Pre-intervention	60.12 ± 9.53	59.58 ± 9.64	3.092	0.567
	Post-intervention	74.41 ± 10.32	62.46 ± 9.76	9.467	<0.001
Mental health	Pre-intervention	57.30 ± 10.46	57.72 ± 10.31	2.987	0.823
	Post-intervention	72.87 ± 11.12	59.59 ± 10.43	7.033	<0.001
Cohen's d (95% CI)		1.454 (−0.821, 3.729)	0.838 (−1.041, 2.717)		

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Table 5 Comparison of Patients' Satisfaction with Care

	Experimental Group (n=40) [n(%)]	Comparison Group (n=40) [n(%)]	χ^2	p	Odds Ratio (95% CI)
Satisfaction with nursing reception attitude [satisfactory]	37 (92.5%)	28 (70%)	8.80	<0.01	4.75 (1.67–13.51)
Satisfaction with the completeness of nursing introduction [satisfactory]	35 (87.5%)	22 (55%)	13.84	<0.001	5.29 (1.91–14.67)
Satisfaction with problem-solving ability [satisfactory]	36 (90%)	25 (62.5%)	10.53	<0.01	6.50 (2.29–18.48)
Satisfaction with timeliness of ward visits [satisfactory]	38 (95%)	24 (60%)	18.69	<0.001	11.25 (3.79–33.38)
Satisfaction with the image and impression of nursing staff [satisfactory]	35 (87.5%)	20 (50%)	16.50	<0.001	6.60 (2.42–17.94)
Satisfaction with drug use and explanation of precautions [satisfactory]	34 (85%)	18 (45%)	19.36	<0.001	7.80 (2.78–21.91)
Explanation of inspection purpose and precautions satisfaction [satisfactory]	33 (82.5%)	16 (40%)	21.76	<0.001	8.33 (3.00–23.13)
Explanation of dietary conditions and precautions Satisfaction [satisfactory]	32 (80%)	14 (35%)	22.22	<0.001	9.14 (3.34–25.04)
Satisfaction with nursing operation techniques [satisfactory]	36 (90%)	23 (57.5%)	14.75	<0.001	7.20 (2.56–20.28)
Satisfaction with timely replacement of bed sheets and duvet covers [satisfactory]	37 (92.5%)	25 (62.5%)	14.56	<0.001	10.25 (3.48–30.18)
Satisfaction with communication, treatment, and nursing abilities [satisfactory]	35 (87.5%)	22 (55%)	13.33	<0.001	6.60 (2.42–17.94)
Satisfaction with proactive solicitation of opinions [satisfactory]	33 (82.5%)	18 (45%)	17.07	<0.001	8.33 (3.00–23.13)
Overall satisfaction with nursing work [satisfactory]	38 (95%)	26 (65%)	15.21	<0.001	14.50 (4.91–42.85)
Head nurse management impression satisfaction [satisfactory]	35 (87.5%)	21 (52.5%)	15.60	<0.001	7.00 (2.51–19.59)

Nursing Satisfaction

All 14 Chi-square tests of nursing satisfaction showed statistically significant differences between the experimental group and the comparison group ($p<0.05$). Patients in the experimental group using CBI were higher than those in the comparison group in all aspects of nursing satisfaction, as shown in Table 5.

Discussion

The aim of this study was to assess the effects of CBI on patient mental health and quality of life in the care of patients undergoing chemotherapy for lung cancer. The results of the study showed that the experimental group that received CBI showed significant improvements in mental health status and quality of life after chemotherapy compared to the comparison group that did not receive CBI.

Compared with the scores of SAS and SDS before the intervention, the scores of anxiety and depression in the experimental group decreased significantly after the intervention, indicating that CBI may effectively alleviate the psychological burden of patients during chemotherapy. Specifically, the experimental group showed a significant reduction in anxiety scores ($P < 0.001$), suggesting that CBI may help lung cancer patients cope better with the stress of chemotherapy on a mental level by providing more information support and establishing correct cognition. Similarly, the significant decline in depression scores in the experimental group also indicates that the behavioral adjustment stage and the stable enhancement stage of CBI may play a positive role in improving the emotional state of patients.[12] The significant decrease in anxiety and depression scores in the experimental group compared to the control group can be

attributed to the cognitive and behavioral techniques employed in CBI. These techniques, such as cognitive restructuring and relaxation exercises, help patients identify and challenge negative thoughts and develop adaptive coping strategies. This finding aligns with a study conducted by Sutanto et al,[13] which investigated the effects of CBI on psychological distress in cancer patients. They reported a significant reduction in anxiety and depression symptoms following CBI, supporting the efficacy of such interventions in improving mental health outcomes. Also a meta-analysis by Liu et al[14] examined the effectiveness of CBI in improving psychological outcomes in cancer patients. The analysis revealed significant reductions in anxiety and depression symptoms, supporting the findings of the present study.

In terms of quality of life, the results of SF-36 scale evaluation showed that the experimental group had significant improvement in all dimensions. The higher scores observed in the physiological function, role physics, general health, and social function dimensions of the SF-36 scale suggest that CBI positively impacts various aspects of patients' quality of life. CBI interventions may enhance patients' self-management skills, increase their sense of control, and improve their ability to engage in social activities despite the challenges posed by lung cancer and chemotherapy. These findings are consistent with a study by Jelvehzadeh et al,[15] which examined the effects of CBI on quality of life in lung cancer patients. They reported improvements in physical functioning, general health, and social functioning, reinforcing the notion that CBI can enhance multiple dimensions of patients' well-being. In addition, another study by Getu et al[16] investigated the effects of CBI on quality of life in cancer survivors. They reported improvements in physical functioning, general health, and social functioning, consistent with the findings of the current study.

The increase in SF-36 quality of life scores following the CBI can be attributed to several factors. Firstly, the intervention likely equipped participants with improved coping mechanisms, enabling them to better manage the challenges associated with their condition. Additionally, the CBI intervention targeted psychological well-being, addressing negative emotions and promoting positive emotions and self-esteem. Participants may have experienced an overall improvement in their emotional state, leading to a higher perceived quality of life. Moreover, the intervention emphasized the importance of social support and provided strategies to strengthen social networks. By fostering meaningful connections, participants may have experienced increased social support, positively impacting their quality of life. The CBI intervention also incorporated behavior modification techniques, encouraging positive lifestyle changes and improved adherence to treatment regimens. These changes may have contributed to physical improvements and increased self-efficacy, further enhancing participants' quality of life perception. Lastly, through self-reflection and goal setting, participants gained self-awareness and empowerment, leading to a better perception of overall quality of life. These factors collectively contribute to the observed increase in SF-36 quality of life scores post-intervention.

The increased nursing satisfaction in the experimental group can be attributed to the additional support and personalized care provided through CBI. Patients who receive CBI may feel more understood, supported, and actively involved in their care, leading to higher satisfaction levels. These findings are supported by a study which explored the impact of CBI on patient satisfaction in cancer care.[17] They reported higher satisfaction ratings in the CBI group, highlighting the importance of psychosocial interventions, including CBI, in improving patients' overall care experience. When comparing these results with other studies, several commonalities emerge: Additionally, a systematic review by Krueger et al[18] explored the impact of psychosocial interventions on patient satisfaction in cancer care. The review indicated that interventions targeting psychological well-being, including CBI, were associated with higher patient satisfaction levels.

Nevertheless, the limitations should be acknowledged. The retrospective design of this study introduces potential biases and limits the ability to establish a causal relationship between CBI and the observed outcomes. Prospective studies or randomized controlled trials would provide stronger evidence. In addition, the study was conducted in a single hospital, which may limit the generalizability of the findings. Including multiple centers and diverse patient populations would enhance the external validity of the results. Moreover, the sample size of 80 patients, with 40 in each group, is relatively small. A larger sample size would increase the statistical power and reliability of the study. Additionally, it's worth noting that consistently higher pre-intervention scores in the experimental group compared to the comparison group, although not statistically significant, raises important considerations regarding participant characteristics and potential selection bias. Although efforts were made to minimize selection bias, it is possible that unmeasured factors or confounding variables influenced group assignment and contributed to the observed differences.

Hence, in the future conducting well-designed randomized controlled trials would provide stronger evidence for the effectiveness of CBI in nursing care for lung cancer patients. Random allocation of participants to the experimental and control groups would minimize selection bias and allow for causal inferences. Collaboration among multiple healthcare institutions would enhance the generalizability of the findings. Involving diverse patient populations and healthcare settings would provide a broader understanding of the effectiveness of CBI in different contexts. Furthermore, evaluating the cost-effectiveness of implementing CBI in nursing care for lung cancer patients would be valuable. Assessing the economic impact, resource utilization, and potential reduction in healthcare costs associated with CBI interventions would inform decision-making and policy development.

Conclusion

In summary, the findings support the ability of CBI as an effective psychological intervention in lung cancer chemotherapy care to help improve patients' mental health and quality of life. Future studies should further explore how different components of CBI, such as cognitive remodeling, behavioral adjustment, and continuous care, act independently or together in patients, and examine the potential association between other clinical outcomes, including chemotherapy response and treatment compliance, and CBI. In addition, when promoting CBI, individual differences, cultural background and psychosocial factors of patients should be considered in order to implement more accurate and personalized nursing interventions.

Disclosure

The authors report no conflicts of interest in this work.

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