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A randomized controlled trial on the effects of specialized nursing based on cognitive behavioral intervention on anxiety, depression, and quality of life in patients with newly diagnosed diffuse large B-cell lymphoma

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Abstract: Background: Patients with diffuse large B-cell lymphoma often experience anxiety, depression, and other negative emotions, which not only affect treatment compliance but also significantly reduce their quality of life. Exploring effective nursing intervention strategies to improve patients' psychological state and enhance prognostic levels has become an important issue in clinical practice. **Objective:** To investigate the effects of specialized nursing based on cognitive behavioral intervention on anxiety, depression, and quality of life in patients with newly diagnosed diffuse large B-cell lymphoma, providing evidence-based support for clinical nursing interventions. **Methods:** A single-center, parallel-group, open-label randomized controlled trial design was used from January 2022 to December 2023 in the Hematology Department of Chengdu Shang Jin Nan Fu Hospital. A total of 128 diagnosed patients were recruited and randomly assigned into an experimental group and a control group according to the random number table method, with 64 cases in each group. On the basis of routine nursing, the experimental group received cognitive behavioral intervention, including group lectures, individual follow-up, and relaxation training, for 12 weeks. Anxiety, depression, and quality of life were assessed at pre-intervention (T0), 6 weeks of intervention (T1), 12 weeks of intervention (T2), and 3 months after the end of the intervention (T3). **Results:** There was no statistically significant difference ($P > 0.05$) between the two groups in terms of anxiety, depression, and quality of life scores at baseline. At 6 weeks (T1), 12 weeks (T2), and 3 months after the end of the intervention (T3), the experimental group had significantly lower anxiety and depression scores than the control group (t test, $P < 0.01$) and significantly higher quality of life scores than the control group (t test, $P < 0.01$). Repeated measures ANOVA showed a significant time $\times$ group effect for anxiety, depression, and quality of life ($P < 0.001$), indicating that the trend of improvement in emotional state and quality of life in the intervention group was significantly better than that in the control group. **Conclusion:** Specialized nursing based on cognitive behavioral intervention can significantly improve anxiety and depression in patients with newly diagnosed diffuse large B-cell lymphoma and continuously enhance their quality of life. This provides an important reference for optimizing and promoting clinical nursing models for this population.

Keywords: diffuse large B-cell lymphoma; cognitive behavioral intervention; anxiety; depression

1. Introduction

Diffuse large B-cell lymphoma has been witnessing a continuously rising incidence worldwide and is one of the most common pathological types among non-Hodgkin's lymphomas, with considerable variation in disease progression and

prognosis [1]. This increase in incidence highlights the urgent need for effective treatment strategies and supportive care approaches tailored to the unique challenges faced by patients with this type of lymphoma. Clinical treatments include chemotherapy, immunotherapy, and stem cell transplantation, but patients often face heavy psychological pressure and physiological burdens during diagnosis and treatment [2]. The physical side effects of these treatments, such as fatigue, nausea, and hair loss, can exacerbate the psychological strain, leading to a cycle of distress that complicates recovery. Negative emotions such as anxiety and depression are common in this population and have a profound impact on treatment compliance and long-term quality of life. Research has shown that when patients experience high levels of anxiety or depression, they may be less likely to adhere to treatment regimens, which can adversely affect their prognosis. Related studies have gradually integrated psychological interventions into comprehensive cancer treatment, but targeted interventions and systematic follow-up data for patients with diffuse large B-cell lymphoma are still relatively lacking [3]. This gap in research indicates a pressing need for the development of tailored psychological support programs that specifically address the emotional and psychological needs of these patients. Based on these understandings, the need for research on how to reduce patients' psychological burdens and optimize their quality of life has become increasingly prominent. Existing literature has reported that cognitive-behavioral interventions have shown certain effectiveness in various malignant tumor patient groups, but the number of studies focusing on diffuse large B-cell lymphoma is limited, and the quality of evidence is not sufficient [4,5]. Many existing studies lack large sample sizes or rigorous randomized controlled designs, resulting in unclear reproducibility of intervention effects and limited promotion value [6]. Patients at the early stage of the disease often face uncertainty in treatment and a high level of anxiety. Psychological support and behavioral guidance during this special period are particularly critical for subsequent compliance and rehabilitation, yet there is still a lack of a complete intervention model centered on cognitive-behavioral intervention combined with specialized nursing management [7]. Such deficiencies affect the formulation of overall strategies for emotional adjustment and quality of life maintenance in clinical practice and also hinder the implementation of continuous follow-up and long-term management [8]. This study aims to validate, through a randomized controlled trial, the intervention effects of specialized nursing based on cognitive-behavioral intervention on anxiety, depression, and quality of life in newly diagnosed diffuse large B-cell lymphoma patients. The study focuses on multiple measurements during the 12-week intervention and at 3 months after the intervention, striving to provide evidence-based support for the design and promotion of specialized nursing programs. The intervention pathway integrates cognitive restructuring, behavioral training, and individualized follow-up in order to achieve a more flexible and operable nursing model in clinical practice. A feature of this study is the combination of the disease-specific characteristics of patients and their psychological support needs, forming a set of intervention procedures suitable for such lymphoma patients, and recording the medium-term sustainable effects of the intervention through systematic follow-up, laying the foundation for future multi-center validation and the application of digital health management platforms.

2. Materials and methods

2.1. Research design

This study adopted a single-center, parallel-group, open-label randomized controlled trial design, conducted in the Department of Hematology of Chengdu Shang Jin Nan Fu Hospital from January 2022 to December 2023. A total of 128 newly diagnosed diffuse large B-cell lymphoma patients were recruited and randomly assigned to the experimental group and the control group using a random number table method, with 64 cases in each group. This study was approved by the hospital's ethics committee (approval number 2022-SC-0159), and all enrolled patients signed a written informed consent form.

Before the start of the study, a statistician, who was not directly involved in the intervention, generated the randomization sequence using a computer and sealed it in an opaque envelope with an independent number. The study leader and nursing staff who conducted the intervention only became aware of the grouping results after patient allocation. There was no double-blind design for patients, but the personnel responsible for statistical analysis did not participate in the intervention and remained blinded.

2.2. Study subjects

Inclusion criteria: (1) pathologically confirmed newly diagnosed diffuse large B-cell lymphoma; (2) age 18–75 years; (3) ECOG performance status score of 0–2; (4) able to communicate independently and complete the scales; (5) signed a written informed consent form and voluntarily cooperated to complete this study. Exclusion criteria: (1) concomitant other severe malignancies or major acute life-threatening illnesses; (2) have received any systematic psychological treatment or cognitive-behavioral intervention; (3) combined with severe mental disorders (such as schizophrenia) or severe cognitive impairment; (4) unable to complete follow-up as required by the study or withdrew from the study midway; (5) severe infections or other factors that prevent the completion of the entire intervention process.

2.3. Intervention protocol

2.3.1. Experimental group

According to the principles of Cognitive Behavioral Therapy (Cognitive Behavioral Therapy, CBT), the intervention helps patients identify and adjust maladaptive cognitions and behavior patterns, thereby reducing anxiety and depression while improving quality of life. To ensure consistency in the implementation of the intervention, the research team developed a standardized intervention manual and a process supervision form, covering the objectives of each stage, specific operational points, and the materials used. During the intervention, several members of the nursing team hold a supervisory meeting once a week to discuss difficult cases and check the intervention record forms.

The intervention period lasts for 12 weeks, including one group session per week (5–8 people per group), each lasting 60 min, and two individual follow-up sessions per week, each about 15–20 min. Follow-up can be conducted face-to-face or by

telephone. The intervention team consists of two specialized nurses with more than five years of experience in hematology oncology nursing and one clinical nurse who holds a national psychological counselor qualification. Before the study began, all team members received uniform training on cognitive behavioral intervention and lymphoma-specific nursing, becoming familiar with the use of the intervention manual and the process supervision form.

The intervention mainly includes cognitive education and cognitive restructuring, behavior training and relaxation techniques, coping skill development, and continuous follow-up and documentation. In the early stage of the intervention, a study nurse and a psychological counselor first conduct a one-on-one interview to understand the patient's primary concerns and erroneous cognitions and use case examples to explain the concept of cognitive distortion, guiding the patient to perceive the disease and treatment process in a more reasonable way. Subsequently, weekly group sessions are carried out by a psychological counselor who teaches relevant skills and leads the patients in repeated practice. After class, self-practice is conducted twice a day, each session lasting about 15 min, under telephone supervision by a study nurse, who records completion of the exercises. Each patient receives at least two individual follow-up sessions per week by specialized nursing staff, focusing on recent psychological status and coping methods, and providing targeted guidance based on the standardized manual. The researchers record patients' cognitive, emotional, and behavioral changes in real time during interactions. To make the intervention plan more intuitive, **Table 1** below outlines the main content, duration, materials, and implementation process of the 12-week group sessions.

Table 1. 12-week cognitive behavioral intervention weekly arrangement and quality control key points.

Week	Primary intervention objective	Core content	Materials used	Quality control measures
1	Establish a therapeutic alliance/initial cognitive education	Introduce the basic knowledge of diffuse large B-cell lymphoma and the intervention objectives/explain types of cognitive distortion, and demonstrate the emotion record form	PPT slides, patient handbook, emotion record form	The lecturer follows the manual/video spot check/checking with the supervision form
2	Identify negative automatic thoughts/introduction to cognitive restructuring	Help patients identify typical negative thoughts/discuss alternative positive cognitions and coping skills	Cognitive restructuring practice form, case discussion materials	Group discussion feedback/item-by-item check/checking with the supervision form
3	Strengthen cognitive restructuring/initial coping skill development	Review cognitive restructuring techniques/explain problem-solving skills and self-talk methods	Problem-solving checklist, role-play script	Role-play video recording/checking with the supervision form
4	Relaxation technique training/manage anxiety symptoms	Explain the steps of progressive muscle relaxation and breathing relaxation techniques/conduct on-site training and evaluate effects	Relaxation training audio, step-by-step relaxation action guide diagram	On-site observation/individual follow-up/checking with the supervision form
5	Strengthen relaxation training/emotional self-monitoring	Share experiences of relaxation practice from the previous week/guide the recording of anxiety and depression mood fluctuations and triggering factors	Mood monitoring form, self-assessment scales	Telephone follow-up review/checking with the supervision form
6	Advanced coping skills/initial stress management	Explain common stressor identification/introduce stress management strategies (time management, task breakdown, etc.)	Stressor checklist, coping skill video clips	Group discussion feedback/checking with the supervision form

Table 1. (Continued).

Week	Primary intervention objective	Core content	Materials used	Quality control measures
7	Correct maladaptive behavior patterns/reshape positive behavior habits	Help patients formulate positive behavior plans/guide them to record and reinforce positive behaviors	Behavior record form, motivational cards	Individual reporting/checking with the supervision form
8	Periodic review of cognitive restructuring/deeper stress management	Review cognitive restructuring and stress management techniques/conduct group discussions on difficult cases	Group discussion outline, key prompts for cognitive restructuring	Group PK sharing/checking with the supervision form
9	Advanced relaxation techniques/emotional coping contingency plan	Introduce emotional crisis coping strategies/demonstrate guided imagery-based meditation training	Meditation audio, guided imagery training diagram	On-site practice/telephone follow-up/checking with the supervision form
10	Establish social support/maintain positive communication	Teach social communication skills/assess family and social support systems	Compilation of interpersonal communication cases, social support network diagram	Role-play exercises/checking with the supervision form
11	Integrate coping skills/develop a long-term self-management plan	Review all previous techniques/formulate an individualized follow-up self-management and emotional maintenance plan	Individualized coping strategy checklist, follow-up plan form	Group sharing/checking with the supervision form
12	Summarize and consolidate/evaluate intervention effectiveness	Check achievement of intervention objectives/reinforce patients' self-efficacy/plan subsequent follow-up arrangements	Intervention effectiveness questionnaire, satisfaction survey form	Summary report/final check of the intervention manual/checking with the supervision form

After the group teaching sessions end, on the following day, the research nurse conducts a telephone follow-up to check the completion status of the past week's homework, including practice frequency, feedback, and any questions. Before the next teaching session, the nursing team compiles the follow-up records and collectively addresses common issues in class, providing one-on-one guidance for individual patients with special circumstances. To ensure intervention consistency, the nursing team holds a supervisory meeting every week, sampling the teaching quality through video or audio recordings and checking the completion of each intervention step against the standardized manual and checklist while conducting on-site discussion and correction regarding complex situations. The intervention team may also hold ad hoc training sessions at any time for newly arising problems or complex cases to continuously optimize the intervention content.

2.3.2. Control group

Patients in the control group received the hospital's current routine nursing care, including routine health education, medication management, complication observation, and routine psychological counseling, without the implementation of systematic cognitive behavioral intervention. Routine nursing care included once-weekly medication and lifestyle guidance by specialized nurses and twice-weekly routine nursing follow-ups. The focus of the nursing content was on basic disease management and routine psychological support.

2.4. Observation indicators and measurement tools

In this study, multiple collections of each observation indicator were conducted at four time points: before the intervention (T0, baseline), at 6 weeks of intervention

(T1), at 12 weeks of intervention (T2, end of intervention), and 3 months after the end of the intervention (T3). Anxiety and depression levels were assessed using the Anxiety Subscale (HADS-A) and the Depression Subscale (HADS-D) of the Hospital Anxiety and Depression Scale [9], each containing 7 items scored on a 0–3 scale, with a total score ranging from 0 to 21. Quality of life was evaluated using the core quality-of-life scale for cancer developed by the European Organization for Research and Treatment of Cancer (EORTC QLQ-C30) [10], focusing only on the global health status overall score. After standardized conversion, the score ranges from 0 to 100, with higher scores indicating better quality of life. In addition, at T0, demographic characteristics (such as age, gender, and educational level) and clinical indicators (such as disease stage, ECOG performance status, and comorbidities) were collected to assess the baseline comparability between the experimental group and the control group and to provide a basis for subsequent multivariate analysis.

2.5. Data collection and management

After the patient signs the informed consent form, a trained research nurse assigns a unique number and distributes a paper questionnaire to the patient at T0, T1, T2, and T3. The patient is guided to fill out the questionnaire independently as required, and any possible comprehension issues are clarified on-site, thereby reducing missing or incorrect responses. After all paper questionnaires are collected, two research assistants independently enter the questionnaire results into an electronic spreadsheet. Upon completion of data entry, they compare the two electronic datasets line by line and verify against the original questionnaires in a timely manner to ensure the accuracy of data entry. Additionally, dedicated quality control personnel conduct random checks on 20% of the original data and electronic data to further verify data accuracy. All paper questionnaires and electronic data are centrally managed by the principal investigator. Paper questionnaires are stored in a document room with access control, while electronic data are kept on an encrypted research database server accessible only to core members of the research team. The database is backed up weekly to ensure data security and confidentiality.

2.6. Statistical analysis

This study used SPSS 26.0 software for statistical analysis, with the significance level set at two-sided $\alpha = 0.05$ ($P < 0.05$ indicates a statistically significant difference). The Shapiro-Wilk method was used for the normality test, and Levene's test was used for homogeneity of variance or sphericity tests. For continuous variables that conformed to a normal distribution and homogeneity of variance, an independent samples *t*-test or repeated measures analysis of variance was used; if not, the Mann-Whitney *U* test or paired non-parametric tests were employed [11]. Bonferroni correction was applied to the results of multiple comparisons in the repeated measures analysis of variance to reduce Type I errors caused by multiple testing. When the amount of missing data was small, the Last Observation Carried Forward (LOCF) method was used, and intention-to-treat analysis (intention-to-treat) was performed. To further explore the differences in major outcome indicators such as anxiety, depression, and quality of life between the intervention group and the control group,

and to evaluate the influence of confounding factors including age, sex, disease stage, and ECOG score, multiple linear regression models or generalized linear models were established for analysis [12].

3. Results

3.1. Participant flow and baseline data comparison

A total of 128 patients were randomly assigned to the experimental group and the control group (64 cases in each), with 3 and 4 patients dropping out for personal reasons, respectively. Finally, all patients were included in the data analysis using the intention-to-treat (ITT) method (**Figure 1**). A comparative analysis of baseline demographic and clinical characteristics between the experimental group and the control group showed no statistically significant differences in age, gender, educational level, disease stage, ECOG performance status, or comorbidity distribution ($P > 0.05$). This indicates good comparability between the two groups before the intervention, laying a foundation for the subsequent evaluation of intervention effects (**Table 2**).

3.2. Anxiety and depression level results

There was no significant difference in anxiety scores and depression scores between the experimental group and the control group at baseline (T0) ($P > 0.05$). At 6 weeks of intervention (T1), 12 weeks of intervention (T2), and 3 months after the completion of the intervention (T3), the anxiety and depression scores in the experimental group both decreased significantly and were significantly lower than those in the control group at each time point ($P < 0.01$, t -test). Repeated measures analysis of variance showed that the time $\times$ group effect was statistically significant, with the F -value for anxiety scores being $F = 12.473$, $P < 0.001$ (**Figure 2A**) and for depression scores being $F = 9.478$, $P < 0.001$, indicating that the trends of anxiety and depression scores differed significantly over time between the two groups due to variations in the interventions (**Figure 2B**).

Table 2. Comparison of baseline demographic and clinical characteristics between the two groups.

Variable	Experimental group ($n = 64$)	Control group ($n = 64$)	Test value	P value
Age (years)	51.62 ± 5.70	52.18 ± 5.43	$t = 0.523$	0.602
Gender (male/female)	36/28	39/25	$\chi^2 = 0.277$	0.598
Educational level (cases, %)			$\chi^2 = 0.498$	0.920
Primary school or below	8 (12.50%)	9 (14.06%)		
Junior high school	16 (25.00%)	14 (21.88%)		
High school	28 (43.75%)	27 (42.19%)		
Junior college or above	12 (18.75%)	14 (21.88%)		
Disease stage (cases, %)			$\chi^2 = 0.445$	0.931
Stage I	12 (18.75%)	10 (15.63%)		
Stage II	18 (28.13%)	20 (31.25%)		
Stage III	20 (31.25%)	21 (32.81%)		

Table 2. (Continued).

Variable	Experimental group (n = 64)	Control group (n = 64)	Test value	P value
Stage IV	14 (21.88%)	13 (20.31%)		
ECOG score (cases, %)			$\chi^2 = 0.367$	0.833
0 points	26 (40.63%)	24 (37.50%)		
1 point	30 (46.88%)	32 (50.00%)		
2 points	8 (12.50%)	8 (12.50%)		
Comorbidities (cases, %)			$\chi^2 = 0.166$	0.684
Yes	22 (34.38%)	20 (31.25%)		
No	42 (65.63%)	44 (68.75%)		

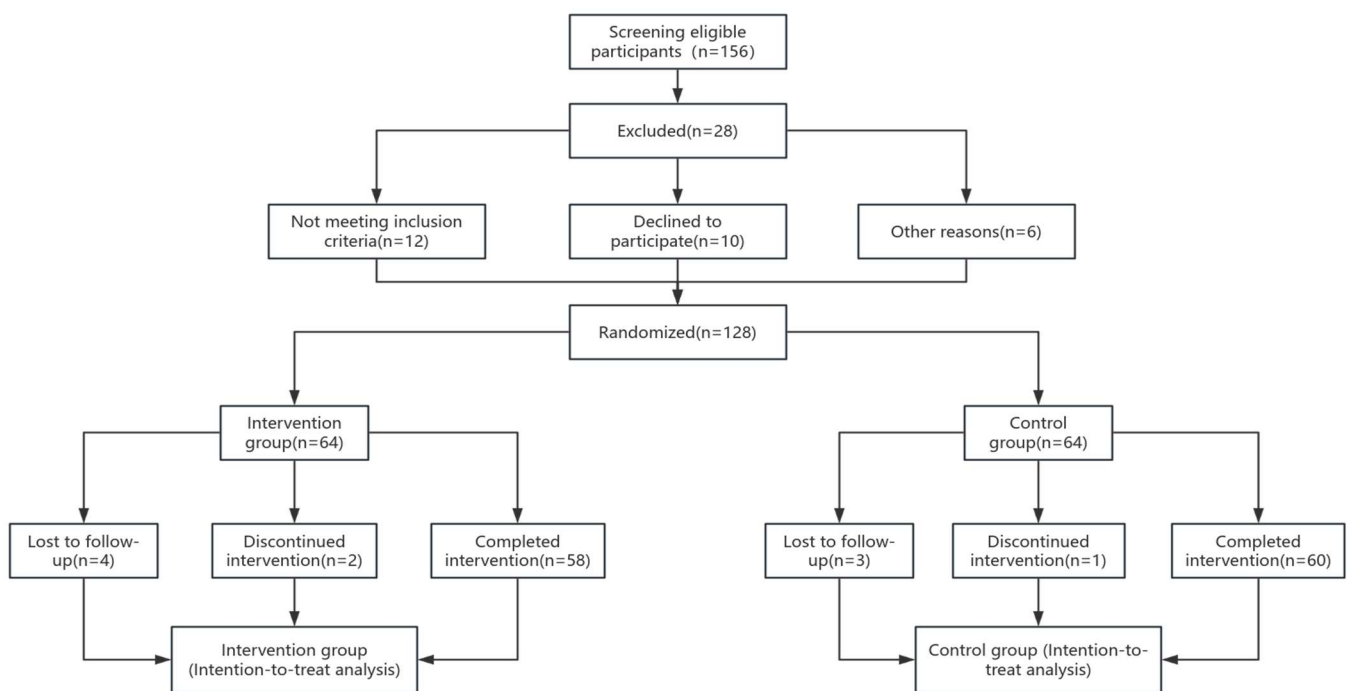


Figure 1. CONSORT flow diagram.

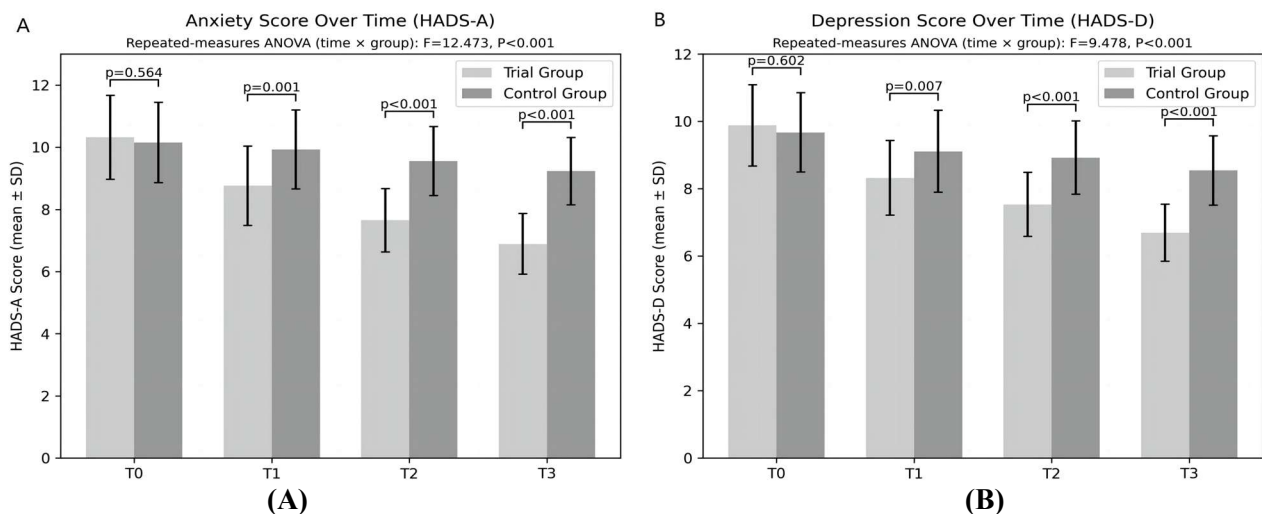


Figure 2. (A) Trend chart of anxiety scores over time; (B) trend chart of depression scores over time. Inter-group comparisons at the same time points were performed using *t*-tests, with $P < 0.05$ indicating statistical significance.

3.3. Quality of life results

There was no significant difference in quality of life scores between the experimental group and the control group at baseline (T0) ($P > 0.05$). At 6 weeks of intervention (T1), 12 weeks of intervention (T2), and 3 months after the completion of the intervention (T3), the scores of the experimental group increased significantly and were all significantly higher than those of the control group ($P < 0.01$, t -test). Repeated measures analysis of variance showed that the time $\times$ group effect was significant ($F = 10.726$, $P < 0.001$), indicating that the trends in quality of life scores between the two groups differed significantly due to different intervention methods, and the increase over time in the experimental group was significantly greater than that in the control group (**Figure 3**).

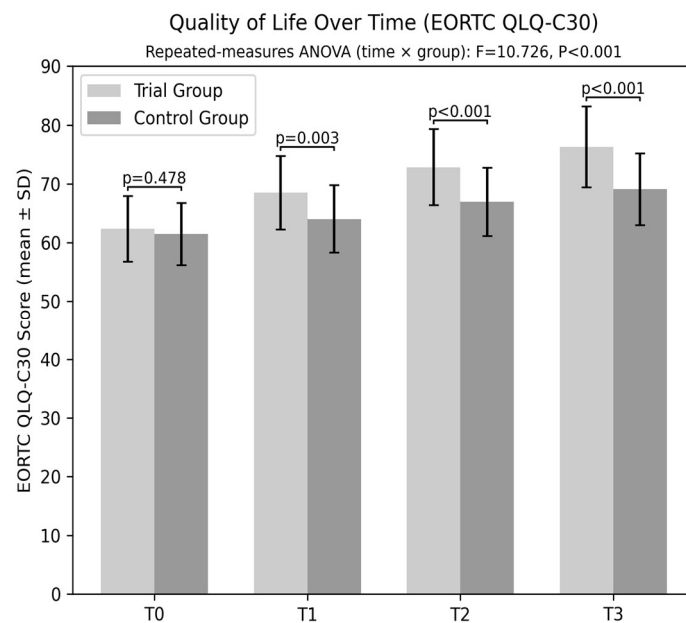


Figure 3. Trend chart of quality of life scores over time. Inter-group comparisons at the same time points were performed using t -tests, with $P < 0.05$ indicating statistical significance.

3.4. Multiple regression analysis

Multiple linear regression analysis showed that the intervention method had a significant independent effect on the anxiety, depression, and quality of life scores ($P < 0.01$). Age demonstrated a significant association in all three models, being positively correlated with anxiety and depression scores and negatively correlated with quality of life scores ($P < 0.05$). Gender had a significant impact on anxiety and quality of life scores ($P < 0.05$), while its effect on depression scores was near statistical significance ($P = 0.063$). ECOG performance status was a significant predictor in all models, positively correlated with anxiety and depression scores and negatively correlated with quality of life scores ($P < 0.05$). Disease stage showed a significant effect only in the depression score model ($P = 0.034$) and did not reach statistical significance in the anxiety and quality of life score models ($P > 0.05$) (**Tables 3–5**).

Table 3. Results of multiple linear regression analysis (Anxiety score, HADS-A).

Variable	$\beta \pm SE$	$t (P)$	95% CI
Intercept	10.37 $\pm$ 0.48	21.605 (< 0.001)	(9.43, 11.31)
Intervention method	-1.26 $\pm$ 0.40	-3.150 (0.002)	(-2.06, -0.46)
Age (years)	0.05 $\pm$ 0.02	2.518 (0.013)	(0.01, 0.09)
Gender (male = 1, female = 0)	0.69 $\pm$ 0.29	2.379 (0.019)	(0.11, 1.27)
Disease stage (Stage)	0.24 $\pm$ 0.26	0.923 (0.358)	(-0.27, 0.74)
ECOG performance status	0.80 $\pm$ 0.33	2.424 (0.017)	(0.14, 1.46)

Table 4. Results of multiple linear regression analysis (Depression score, HADS-D).

Variable	$\beta \pm SE$	$t (P)$	95% CI
Intercept	9.65 $\pm$ 0.45	21.444 (< 0.001)	(8.75, 10.55)
Intervention method	-1.12 $\pm$ 0.36	-3.111 (0.002)	(-1.84, -0.40)
Age (years)	0.04 $\pm$ 0.01	2.666 (0.009)	(0.01, 0.07)
Gender (male = 1, female = 0)	0.45 $\pm$ 0.24	1.875 (0.063)	(-0.02, 0.92)
Disease stage (Stage)	0.60 $\pm$ 0.28	2.143 (0.034)	(0.05, 1.15)
ECOG performance status	1.15 $\pm$ 0.40	2.875 (0.005)	(0.35, 1.95)

Table 5. Results of multiple linear regression analysis (Quality of life score, EORTC QLQ-C30).

Variable	$\beta \pm SE$	$t (P)$	95% CI
Intercept	55.72 $\pm$ 4.12	13.528 (< 0.001)	(47.60, 63.84)
Intervention method	7.45 $\pm$ 2.10	3.548 (0.001)	(3.31, 11.59)
Age (years)	-0.18 $\pm$ 0.05	-3.611 (0.001)	(-0.28, -0.08)
Gender (male = 1, female = 0)	-2.06 $\pm$ 1.03	-2.000 (0.047)	(-4.10, -0.02)
Disease stage (Stage)	-1.94 $\pm$ 1.42	-1.366 (0.174)	(-4.78, 0.93)
ECOG performance status	-4.33 $\pm$ 1.85	-2.341 (0.021)	(-7.96, -0.73)

4. Discussion

Based on the results of this study, it can be seen that the intervention group achieved significant improvements in anxiety, depression scores, and quality of life scores, whereas no such noticeable changes were observed in the control group within the same timeframe. Before the intervention, no statistical differences were noted between the two groups; at 6 weeks (T1), 12 weeks (T2), and 3 months after the completion of the intervention (T3), the multiple measurement values in the intervention group remained superior to those in the control group, indicating that cognitive behavioral intervention plays a prominent role in reducing psychological burden, enhancing compliance, and improving disease control. Compared with the control group, patients in the intervention group showed a marked decrease in anxiety and depression indices, as well as a significant increase in quality of life scores, suggesting that cognitive behavioral intervention is more suitable for the needs of oncology specialist nursing and helps patients adjust negative thought patterns and behaviors [13]. The mid-term follow-up indicators of patients still maintained an

advantage, reflecting that this kind of intervention has a lasting effect in maintaining emotional stability and promoting physical and mental rehabilitation. The magnitude of the decline in anxiety and depression scores is basically consistent with the degree of emotional relief observed clinically, suggesting a notable reduction in irritability and pessimistic emotions in patients' daily lives, which also helps them better cooperate with subsequent treatment. The increase in quality of life scores indicates that patients have achieved more significant improvements in social interactions, role functioning, and self-efficacy, potentially further reducing discomfort and relapse-related anxiety during intervals between treatments. Based on this strategy, the specialized nursing team can provide individualized cognitive restructuring and emotional management plans according to the psychological and physiological changes of patients at different time points, enabling patients to achieve a more positive self-evaluation and recovery of social functioning [14]. The multi-factor analysis shows that the intervention method occupies a dominant position among numerous influencing factors, confirming its crucial value for the psychological status and quality of life in newly diagnosed diffuse large B-cell lymphoma patients. If more center samples can be included and the follow-up period can be extended, the universality and long-term benefits of this intervention strategy will be further confirmed, providing a basis for the deeper promotion of more clinical nursing intervention programs.

Based on the research data, it is evident that patients who received cognitive behavioral intervention exhibited more favorable psychosomatic adaptation at multiple time points. The key to cognitive behavioral intervention lies in utilizing cognitive restructuring to alleviate patients' overly negative associations with their condition and in strengthening self-regulation skills through behavioral training [15,16]. Through group sessions and individual follow-ups, patients repeatedly practice relaxation techniques and share emotional experiences, gradually freeing themselves from fear and helplessness toward the unknown treatment process. Considering the relatively long treatment course and relatively complex complications of diffuse large B-cell lymphoma, this intervention model can intervene promptly when anxiety or depressive symptoms appear, correcting patients' erroneous thinking and enabling them to cope with the disease-related stress load more positively [17]. Observational results indicate that this nursing approach, which is based on cognitive adjustment, can stabilize patients' emotional fluctuations to some extent, improve the executability of clinical interventions and medical instructions, and make patients more actively cooperate with subsequent chemotherapy or immunotherapy regimens [18]. Regarding the subjective feelings and daily functioning reflected by quality-of-life scores, cognitive behavioral intervention also helps patients construct a positive cognitive pathway for symptoms and side effects, providing them with support and motivation in social interactions and household responsibilities [19]. The observed intervention outcomes and their maintenance effects provide practical guidance for clinical nursing work, namely, by fully recognizing patients' psychological vulnerabilities and disease burdens and relying on two main threads of cognitive adjustment and behavioral shaping to gradually enhance patients' self-management abilities. In this way, patients can more effectively cope with uncertainties and physical discomfort during diagnosis and treatment while retaining and improving their family

and social role functioning to a greater extent. Drawing on the experience of similar previous studies, such intervention measures help simultaneously address patients' psychological needs beyond the control of core symptoms, thereby laying a foundation for achieving more comprehensive oncology nursing goals. During the study, the intervention group had an average attendance rate of about 85% for group sessions and a self-reported daily relaxation training completion rate of 72.5%. The control group had a routine nursing follow-up completion rate of about 88.0%, suggesting that this intervention has a certain feasibility and compliance under actual conditions. To ensure the integrity of randomization and reduce selection bias, this study ultimately adopted the principle of intention-to-treat (intention-to-treat) and included all randomly assigned patients in the statistical analysis. Although some participants were lost to follow-up or dropped out, this approach better reflects the actual effect of the intervention in a real clinical environment.

Multiple regression analysis results indicate that intervention method, age, and ECOG performance status have particularly significant effects on patients' anxiety, depression, and quality of life. The intervention method consistently shows a significant role in each model, suggesting that relying solely on routine care is insufficient to meet the psychological needs under different disease courses and demographic characteristics. Age exhibits a notable association with anxiety, depression, and quality of life scores, highlighting the need for clinical care to focus on older patients' acceptance of the treatment process and their emotional management capabilities, while coordinating family and social resources to help them maintain a more stable psychological state [20]. The significance of ECOG performance status indicates that physical fitness is an important factor influencing treatment compliance and emotional fluctuations. Patients with declining physical fitness or at high risk of complications are more prone to anxiety or depression signals at the psychological level, thereby requiring timely multidisciplinary intervention for comprehensive management of factors such as nutrition, pain, and fatigue [21]. The significance of disease stage in the depression model suggests that some patients have a stronger subjective perception of the disease threat, making them more prone to deeper despair and low mood. However, it does not show the same effect in the anxiety and quality of life models, which may be related to the sample size or subjective cognitive differences. This also reminds clinical practice not to blindly regard advanced stage as an absolute high-risk marker for all negative emotions. Based on these findings, clinical intervention needs to integrate the characteristics and disease course states of different patients and apply cognitive behavioral intervention as the core, in conjunction with individualized nursing support, psychological counseling, and functional exercise plans. By accurately targeting high-risk patients who are older, have higher ECOG performance status, and bear a significant psychological burden, it is hoped that anxiety and depression can be alleviated while improving quality of life, thereby creating a more stable treatment and rehabilitation environment for patients with diffuse large B-cell lymphoma.

This study adopted a randomized controlled design with relatively strict control in sample recruitment and intervention procedures; however, as a single-center study, it cannot fully reflect the characteristics of different regions and diverse populations, indicating insufficient sample representativeness. It may not cover the diversity in

disease staging, types of complications, and other aspects, thus requiring further verification of external validity in larger-scale, multi-center follow-up studies. The intervention lasted for 12 weeks, with follow-up conducted 3 months after the intervention ended, but there was still insufficient observation of longer-term intervention effects and changes in relapse rates. The relatively short follow-up period is not sufficient to fully evaluate the maintenance of intervention effects and changes in relapse risk over a longer duration. In the future, consideration could be given to extending the observation period and setting multiple time points to more comprehensively understand the sustained impact of the intervention on patients' emotions and quality of life. The psychological and quality-of-life scales primarily rely on self-assessment, and differences in emotional cognition and expression ability among some patients may lead to subjective bias. Future research could consider multi-center collaboration and introduce objective indicators or third-party assessment tools to provide stronger guarantees for external validity and data accuracy. Real-time tracking and personalized notifications via digital health management platforms may help patients obtain more flexible and continuous intervention support, further enhancing the accessibility of interventions in terms of time and space dimensions, and providing a more solid evidence-based foundation for the long-term psychological care and quality-of-life improvement of patients with diffuse large B-cell lymphoma.

5. Conclusion

In this study, which targeted newly diagnosed diffuse large B-cell lymphoma patients, cognitive behavioral intervention combined with specialized nursing was adopted. The results showed that the intervention group was significantly better than the control group in terms of anxiety, depression, and quality of life. Multiple measurements confirmed that this intervention can effectively reduce patients' psychological burden in the short term and maintain its effect for up to 3 months after the end of the intervention. Further multi-factor regression analysis demonstrated that the intervention method had an independent influence on anxiety, depression, and quality of life, suggesting that clinical practice should implement stratified interventions based on factors such as age and ECOG performance status. Through cognitive restructuring and behavioral training, patients' emotional regulation and social functioning improved significantly, and treatment compliance likewise increased. Although this study employed a single-center design with a relatively limited follow-up period, the results provide strong evidence for subsequent multi-center validation and optimization of intervention strategies and also lay a foundation for exploring the application of digital health management platforms in psychological care and quality-of-life assurance.

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Informed consent: All enrolled patients signed a written informed consent form.

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