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Effects of comprehensive psychological intervention and traditional Chinese medicine on treatment adherence and quality of life in breast cancer patients undergoing chemotherapy

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Abstract

This study aimed to explore how comprehensive psychological intervention combined with traditional Chinese medicine (TCM) external therapy affects treatment adherence and quality of life in breast cancer patients undergoing chemotherapy. The research included 124 patients from January 2023 to December 2023, randomly assigned to either a control group (n=60) receiving standard chemotherapy and routine care and an intervention group (n=64) receiving additional psychological support (mindfulness training, cognitive restructuring, group therapy) and TCM therapies (moxibustion, acupoint application, herbal fumigation). Results showed that the intervention group had significantly better chemotherapy completion (92.2% vs 85.0%) and dose intensity (89.1% vs 80.0%), with fewer delays (10.9% vs 20.0%) and regimen changes (15.6% vs 26.7%). Quality of life improved notably, particularly in emotional (Δ=16.7) and social functions (Δ=14.2). Psychological metrics also improved, with anxiety and depression rates dropping significantly. Additionally, the intervention group experienced fewer severe side effects such as myelosuppression, nausea, fatigue, and neuropathy. These findings suggest that combining psychological support with TCM therapies enhances treatment adherence, quality of life, and psychological well-being while reducing chemotherapy-related adverse effects, offering a promising approach for supportive care in breast cancer patients. *(Afr J Reprod Health 2026; 30 [1]: 86-97).*

Keywords: Breast cancer; Chemotherapy; Comprehensive psychological intervention; TCM external therapy; Treatment adherence; Quality of life; Myelosuppression

Résumé

Cette étude visait à explorer comment une intervention psychologique complète combinée à une thérapie externe de la médecine traditionnelle chinoise (MTC) influence l'observance du traitement et la qualité de vie chez les patientes atteintes d'un cancer du sein recevant une chimiothérapie. La recherche a inclus 124 patientes entre janvier 2023 et décembre 2023, réparties aléatoirement en deux groupes : un groupe témoin (n = 60) recevant la chimiothérapie standard et les soins habituels, et un groupe d'intervention (n = 64) bénéficiant en plus d'un soutien psychologique (formation à la pleine conscience, restructuration cognitive, thérapie de groupe) et de thérapies MTC (moxibustion, application sur points d'acupuncture, fumigation à base de plantes). Les résultats ont montré que le groupe d'intervention présentait une meilleure complétion de la chimiothérapie (92,2 % contre 85,0 %) et une plus grande intensité de dose (89,1 % contre 80,0 %), avec moins de retards (10,9 % contre 20,0 %) et de changements de protocole (15,6 % contre 26,7 %). La qualité de vie s'est nettement améliorée, en particulier dans les domaines émotionnel (Δ = 16,7) et social (Δ = 14,2). Les indicateurs psychologiques se sont également améliorés, les taux d'anxiété et de dépression ayant diminué de manière significative. De plus, le groupe d'intervention a présenté moins d'effets secondaires graves tels que la myélosuppression, les nausées, la fatigue et la neuropathie. Ces résultats suggèrent que la combinaison du soutien psychologique et des thérapies externes de la MTC améliore l'observance du traitement, la qualité de vie et le bien-être psychologique, tout en réduisant les effets indésirables liés à la chimiothérapie, offrant ainsi une approche prometteuse pour les soins de soutien chez les patientes atteintes de cancer du sein. *(Afr J Reprod Health 2026; 30 [1]: 86-97).*

Mots-clés: Cancer du sein ; Chimiothérapie ; Intervention psychologique complète ; Thérapie externe de la médecine traditionnelle chinoise ; Observance du traitement ; Qualité de vie ; Myélosuppression

Introduction

Breast cancer is one of the most common malignancies among women globally, with a trend towards increasing incidence[1]. Despite advances in diagnostic and treatment technologies, chemotherapy remains an essential component of comprehensive breast cancer treatment, especially for high-risk early-stage and advanced patients[2]. However, chemotherapy-related adverse reactions

not only severely affect patients' quality of life but also often lead to decreased treatment adherence, potentially affecting treatment outcomes[3]. A meta-analysis showed that adherence to breast cancer clinical guidelines was significantly associated with better overall survival rates (HR = 0.67), with research indicating that among every 1,000 patients, 129 more patients survived when managed according to clinical guidelines compared to those not managed according to guidelines[4]. Therefore, improving chemotherapy adherence is of significant importance for enhancing patient prognosis[5].

During chemotherapy, breast cancer patients often face multiple physiological and psychological challenges. Physiologically, these mainly include myelosuppression, nausea and vomiting, fatigue, and peripheral neuropathy; psychologically, they manifest as anxiety, depression, and stress responses, with approximately 40-60% of patients experiencing clinically significant psychological distress[6]. These physiological and psychological symptoms interact with each other, forming a vicious cycle that not only reduces quality of life but also directly affects treatment adherence and efficacy[7]. Therefore, adopting effective measures to alleviate chemotherapy-related symptoms and provide psychological support is of significant clinical value for improving patient treatment adherence and quality of life.

Psychological intervention, as an important component of cancer supportive care, has shown positive effects in improving the psychological status and quality of life of cancer patients[8]. Psychological intervention measures such as mindfulness training, cognitive behavioral therapy, and supportive group psychotherapy influence patients' cognitive, emotional, and behavioral responses to disease and treatment through different mechanisms[9]. Research has shown that comprehensive psychological intervention can significantly reduce treatment interruption rates and improve quality of life in breast cancer patients[10].

Traditional Chinese medicine (TCM) theory holds that chemotherapy-related symptoms in breast cancer are closely associated with qi and blood deficiency, spleen and stomach dysfunction, and liver and kidney yin deficiency[11]. External therapies such as moxibustion, acupoint application, and herbal fumigation improve symptoms by stimulating specific acupoints and meridians, regulating organ functions, and restoring qi and blood balance[12]. Existing research often focuses on single intervention approaches, such as psychological intervention alone or TCM intervention alone, with relatively few studies on comprehensive intervention models combining both approaches. Given the complex symptoms and psychological challenges faced by breast cancer patients during chemotherapy, a single intervention may be insufficient to comprehensively address the needs of patients. The combination of comprehensive psychological intervention and TCM external therapy may create complementary synergistic effects, addressing both psychological health and physical symptom relief, embodying an integrated mind-body treatment philosophy.

Therefore, this study aims to investigate the effects of comprehensive psychological intervention combined with TCM external therapy on treatment adherence and quality of life in breast cancer patients during chemotherapy, providing empirical evidence for establishing a more effective supportive care model for breast cancer chemotherapy.

Methods

Study subjects

This study involved 124 breast cancer patients receiving chemotherapy in Gansu Provincial Tumor Hospital from January 2023 to December 2023. Inclusion criteria: (1) age 18-65 years; (2) histopathologically confirmed breast cancer; (3) stage I-III according to the 8th edition of American Joint Committee on Cancer (AJCC) breast cancer staging criteria[13]; (4) planned to receive standard anthracycline and/or taxane chemotherapy regimens; (5) expected survival >6 months; (6) Eastern Cooperative Oncology Group Performance Status (ECOG score) 0-2 points[14]; (7) patients voluntarily participated in this study and signed informed consent. Exclusion criteria: (1) concurrent severe cardiac, hepatic, or renal dysfunction; (2) history of psychiatric disorders or severe cognitive impairment; (3) previous radiotherapy, chemotherapy, or TCM treatment; (4) pregnant or lactating women; (5) poor adherence, unable to cooperate with treatment or follow-up.

Grouping method

Patients were divided into control group (n=60) and intervention group (n=64) using a random number table method. Randomization was completed by a statistician not involved in the research using a computer-generated random number table, and the grouping results were preserved in opaque sealed envelopes. Researchers only opened the envelopes to learn the grouping after patients completed baseline assessments. There were no statistically significant differences between the two groups in baseline data including age, education level, marital status, tumor stage, molecular subtyping, surgical approach, and chemotherapy regimen (P>0.05), indicating comparability.

Intervention methods

Control group

Control group patients received standard chemotherapy regimens and routine care, including: (1) chemotherapy drugs according to National Comprehensive Cancer Network (NCCN) guidelines' recommended anthracycline and/or taxane regimens, one cycle every 3 weeks, for a total of 6-8 cycles [15]; (2) routine preventive medications such as antiemetics and gastroprotective agents; (3) routine health education, including breast cancer knowledge, chemotherapy drug effects and adverse reaction management, daily life care guidance, etc.; and (4) regular follow-up evaluation.

Intervention group

The intervention group implemented comprehensive psychological intervention combined with TCM external therapy based on the control group's routine treatment, with the specific protocol as follows:

Comprehensive psychological intervention

(1) Mindfulness training: twice weekly, 45 minutes each session, guided by certified mindfulness training therapists, including mindful breathing, body scanning, mindful walking, etc., while teaching patients self-practice techniques at home (15-20 minutes daily). (2) Cognitive behavioral therapy: once weekly, 60 minutes each session, for a total of 8 sessions, led by clinical psychologists, helping patients identify negative automatic thoughts related to chemotherapy, restructure cognitive patterns, and learn positive coping strategies. (3) Supportive group psychotherapy: once every 2 weeks, 90 minutes each session, conducted in small groups of 8-10 people, guided by psychological counselors and senior oncology specialist nurses, including emotional expression, sharing disease experiences, mutual support, etc. (4) Health education: providing individualized health knowledge lectures, once weekly, 30 minutes each session, covering nutritional guidance, moderate exercise recommendations, sleep management, etc.

TCM external therapy

(1) Moxibustion therapy: using suspended moxibustion method, 30 minutes each session, three times weekly. Main acupoints were Qihai (CV6), Guanyuan (CV4), Zusanli (ST36), Sanyinjiao (SP6), Xuehai (SP10); supplementary acupoints were selected according to different symptoms: Dazhui (GV14) and Feishu (BL13) for fatigue; Neiguan (PC6) and Zhongwan (CV12) for nausea and vomiting; Pishu (BL20) and Shenshu (BL23) for myelosuppression [16]. Moxibustion distance was 2-3 cm, until local skin redness and warmth was achieved. (2) Acupoint application: using herbal applications, main herbs consisting of Astragalus 30g, Codonopsis 20g, Angelica 15g, Atractylodes 15g, Rehmannia 15g, Ligusticum 10g, ground into powder and mixed with appropriate ginger juice and honey into a paste. Application acupoints were the same as moxibustion main acupoints, retained for 6-8 hours each time, three times weekly. (3) Herbal fumigation: brewing 600ml of medicinal liquid with Astragalus, Angelica, Cinnamon Twig, Carthamus, and Salvia, and when temperature dropped to 40-45°C, guiding patients in hand and foot fumigation for 20 minutes each time, twice weekly, mainly targeting chemotherapy-related peripheral neuropathy symptoms.

The comprehensive intervention began from the patient's first chemotherapy session until the completion of the entire chemotherapy course. Psychological intervention and TCM external therapy were conducted simultaneously throughout chemotherapy, with intervention frequency and intensity appropriately adjusted according to individual patient conditions and chemotherapy responses. Assessment and follow-up continued

from the beginning of intervention until 2 months after completion of chemotherapy.

Observed outcome indicators and evaluation methods

Treatment adherence indicators

(1) Chemotherapy completion rate: proportion of patients completing all planned chemotherapy cycles; (2) Chemotherapy dose intensity achievement rate: proportion of patients receiving ≥85% of planned dose; (3) Chemotherapy delay rate: proportion of patients with chemotherapy delay >7 days; (4) Chemotherapy regimen modification rate: proportion of patients requiring dose reduction or regimen change.

Quality of life assessment

The European Organization for Research and Treatment of Cancer Quality of Life Core Questionnaire (EORTC QLQ-C30) and Breast Cancer-Specific Module (QLQ-BR23) were used for assessment [17]. EORTC QLQ-C30 includes functional scales (physical, role, cognitive, emotional, and social functioning), symptom scales (fatigue, nausea and vomiting, pain, etc.), and global health status/quality of life scale; QLQ-BR23 includes functional scales (body image, sexual function, sexual enjoyment, and future perspective) and symptom scales (arm symptoms, breast symptoms, etc.). All scales are converted to 0-100 points, with higher scores on functional scales and global health status scale indicating better function, and higher scores on symptom scales indicating more severe symptoms.

Psychological status assessment

(1) Hospital Anxiety and Depression Scale (HADS): includes anxiety and depression subscales, 7 items each, each item scored 0-3 points, with subscale total scores ≥8 points suggesting anxiety or depression symptoms[18]; (2) Perceived Stress Scale (PSS-10): includes 10 items, assessing patients' perceived level of stress from life events, total score 0-40 points, with higher scores indicating greater perceived stress.

Chemotherapy-related adverse reactions

Mainly including: (1) myelosuppression (leukopenia, neutropenia, thrombocytopenia, anemia); (2) gastrointestinal reactions (nausea, vomiting, diarrhea, etc.); (3) fatigue; (4) hepatorenal function changes; (5) peripheral neuropathy, etc. Incidence rate, severity, and duration of adverse reactions were recorded. Special attention was paid to grade 3-4 neutropenia and febrile neutropenia occurrence, as well as G-CSF usage.

Statistical methods

SPSS 26.0 software was used for statistical analysis. Measurement data conforming to normal distribution were expressed as mean ± standard deviation ($\bar{x}\pm s$), between-group comparisons used independent samples t-test, and within-group comparisons at different time points used repeated measures analysis of variance; count data were expressed as number of cases (%), and between-group comparisons used χ^2 test or Fisher's exact probability method. Paired sample comparisons used paired t-test. $P<0.05$ was considered statistically significant. Sample size estimation was based on treatment adherence and quality of life improvements in previous similar studies, with $\alpha=0.05$, $\beta=0.2$, considering a 15% follow-up dropout rate, finally determining at least 54 cases per group, totaling at least 108 cases.

Ethical considerations

All procedures involving human participants in this study were approved by the institutional ethics committee of the Gansu Provincial Tumor Hospital. All patients included in the present study signed informed consent. The approval number is (Approval No. A202005140027).

Results

Baseline characteristics

A total of 124 breast cancer patients were enrolled in this study, with 64 in the intervention group and 60 in the control group. Table 1 presents the baseline demographic and clinical characteristics of both groups.

Table 1: Baseline demographic and clinical characteristics of study participants

Group	Intervention (n=64)	Control (n=60)	P-value
Age (years)	53.4±11.2	52.8±12.3	0.773
Education level			0.834
Primary school	8 (12.5%)	9 (15.0%)	
Middle school	21 (32.8%)	18 (30.0%)	
High school	17 (26.6%)	14 (23.3%)	
College or above	18 (28.1%)	19 (31.7%)	
Marital status			0.915
Married	53 (82.8%)	49 (81.7%)	
Single	5 (7.8%)	6 (10.0%)	
Divorced/Widowed	6 (9.4%)	5 (8.3%)	
Tumor stage			0.882
Stage I	18 (28.1%)	16 (26.7%)	
Stage II	31 (48.4%)	28 (46.7%)	
Stage III	15 (23.5%)	16 (26.6%)	
Molecular subtype			0.906
Luminal A	19 (29.7%)	18 (30.0%)	
Luminal B	23 (35.9%)	20 (33.3%)	
HER2-enriched	12 (18.8%)	13 (21.7%)	
Triple negative	10 (15.6%)	9 (15.0%)	
Surgical approach			0.783
Modified radical mastectomy	39 (60.9%)	35 (58.3%)	
Breast-conserving surgery	25 (39.1%)	25 (41.7%)	
Chemotherapy regimen			0.694
AC-T	28 (43.8%)	24 (40.0%)	
TC	15 (23.4%)	17 (28.3%)	
EC-T	13 (20.3%)	10 (16.7%)	
TAC	8 (12.5%)	9 (15.0%)	

Table 2: Comparison of chemotherapy adherence between the intervention and control groups

Adherence parameter	Intervention (n=64)	Control (n=60)	P-value
Chemotherapy completion rate	59 (92.2%)	51 (85.0%)	0.023
Dose intensity achievement rate (≥85% of planned dose)	57 (89.1%)	48 (80.0%)	0.016
Chemotherapy delay rate (>7 days)	7 (10.9%)	12 (20.0%)	0.027
Chemotherapy regimen modification rate	10 (15.6%)	16 (26.7%)	0.011

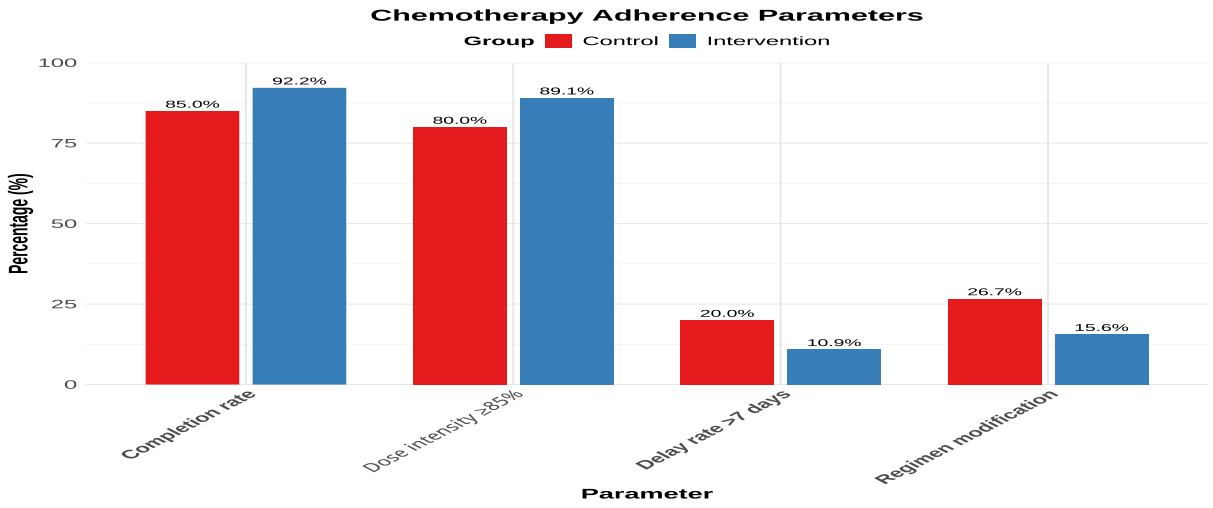

Figure 1: Comparison of chemotherapy adherence parameters between intervention and control group

No statistically significant differences were observed between the two groups in terms of age, education level, marital status, tumor stage, molecular subtype, surgical approach, or chemotherapy regimen (all P>0.05).

Treatment adherence

The intervention group demonstrated significantly better chemotherapy adherence compared to the control group (Table 2). The chemotherapy completion rate was significantly higher in the intervention group than in the control group (92.2% vs. 85.0%, P=0.023). Similarly, the dose intensity achievement rate was significantly higher in the intervention group (89.1% vs. 80.0%, P=0.016). The chemotherapy delay rate was significantly lower in the intervention group (10.9% vs. 20.0%, P=0.027), as was the chemotherapy regimen modification rate (15.6% vs. 26.7%, P=0.011). figure 1

Quality of life assessment

The intervention significantly improved patients' quality of life as measured by the EORTC QLQ-C30 and QLQ-BR23 scales. At baseline, there were no significant differences in overall QoL or functional scale scores between the two groups. After the intervention, the intervention group showed significant improvement in overall QoL scores compared to baseline (Δ=12.3, 95%CI=[7.2, 17.4], P<0.001), while the control group showed modest improvement (Δ=2.7, 95%CI=[0.3, 5.1], P=0.039). The between-group difference in post-intervention overall QoL scores was significant (P<0.001).

In terms of functional scales, the intervention group showed significant improvements in physical, role, emotional, cognitive, and social functioning compared to baseline (all P<0.01). Particularly notable improvements were observed in emotional functioning (Δ=16.7, 95%CI=[11.3, 22.1], P<0.001) and social functioning (Δ=14.2, 95%CI=[9.6, 18.8], P<0.001). The control group showed mild improvement in these domains, with the most notable improvements in emotional functioning (Δ=3.8, 95%CI=[1.2, 6.4], P=0.032) and cognitive functioning (Δ=2.9, 95%CI=[0.7, 5.1], P=0.041). table 3 figure 2

For the QLQ-BR23 module, the intervention group showed significant improvements in body image (Δ=13.9, 95%CI=[8.7, 19.1], P<0.001), future perspective (Δ=15.2, 95%CI=[9.8, 20.6], P<0.001), and sexual functioning (Δ=7.4, 95%CI=[3.1, 11.7], P=0.001).

Significant reductions were observed in breast symptoms (Δ=-11.3, 95%CI=[-16.8, -5.8], P<0.001), arm symptoms (Δ=-9.7, 95%CI=[-14.5, -4.9], P<0.001), and chemotherapy side effects (Δ=-14.8, 95%CI=[-19.7, -9.9], P<0.001). The control group showed minimal improvements in these domains. Between-group differences in post-intervention scores were significant across all domains (all P<0.05). table 4

Psychological status assessment

The intervention group showed significant improvements in psychological status compared to the control group. At baseline, there were no significant differences in HADS anxiety scores, HADS depression scores, or PSS-10 scores between the two groups (all P>0.05).

After intervention, the HADS anxiety scores in the intervention group decreased significantly compared to baseline (Δ=-4.2, 95%CI=[-5.3, -3.1], P<0.001), while the control group showed modest improvement (Δ=-0.6, 95%CI=[-1.2, 0.0], P=0.054). Similarly, HADS depression scores in the intervention group decreased significantly (Δ=-3.7, 95%CI=[-4.8, -2.6], P<0.001), with slight improvement in the control group (Δ=-0.4, 95%CI=[-0.9, 0.1], P=0.089).

The proportion of patients with anxiety (HADS-A ≥8) decreased from 53.1% to 25.0% in the intervention group, while it decreased slightly from 51.7% to 48.3% in the control group (P<0.001 for between-group comparison). Similarly, the proportion of patients with depression (HADS-D ≥8) decreased from 48.4% to 21.9% in the intervention group, while it decreased minimally from 46.7% to 43.3% in the control group (P<0.001 for between-group comparison). The PSS-10 scores also showed significant improvement in the intervention group (Δ=-5.1, 95%CI=[-6.4, -3.8], P<0.001), with minimal change in the control group (Δ=-0.7, 95%CI=[-1.5, 0.1], P=0.083). The between-group differences in post-intervention scores were significant for all psychological measures (all P<0.001). table 5 figure 3.

Table 3: Changes in EORTC QLQ-C30 scores from baseline to post-intervention

EORTC QLQ-C30 Scale	Intervention Group (n=64)			Control Group (n=60)			Between-group P-value
	Baseline	Post-intervention	P-value	Baseline	Post-intervention	P-value	
Global health status/QoL	58.2±15.3	70.5±16.2	<0.001	59.1±14.8	61.8±15.2	0.039	<0.001
Functional scales							
Physical functioning	72.3±14.6	81.7±13.4	<0.001	73.1±15.2	75.3±14.7	0.089	<0.001
Role functioning	65.4±18.2	76.9±16.5	<0.001	66.8±17.9	68.4±17.2	0.212	<0.001
Emotional functioning	61.3±19.7	78.0±15.8	<0.001	63.2±18.4	67.0±17.5	0.032	<0.001
Cognitive functioning	74.9±16.8	83.6±14.3	0.002	75.8±15.7	78.7±15.1	0.041	0.003
Social functioning	68.7±17.5	82.9±15.1	<0.001	69.5±18.1	71.3±17.4	0.167	<0.001
Symptom scales							
Fatigue	52.3±18.6	39.9±17.2	<0.001	51.7±19.2	49.5±18.5	0.135	<0.001
Nausea and vomiting	47.2±21.3	35.6±18.4	<0.001	46.8±20.9	44.2±20.3	0.068	<0.001
Pain	38.5±20.7	29.2±17.3	0.003	37.9±19.8	36.3±19.1	0.241	0.003
Dyspnea	35.2±22.6	26.3±19.7	0.011	36.1±21.9	34.8±21.2	0.267	0.005
Insomnia	56.9±23.4	41.5±20.1	<0.001	55.2±24.1	53.1±23.5	0.152	<0.001
Appetite loss	48.7±25.6	35.2±21.4	<0.001	49.3±24.7	47.5±24.1	0.236	<0.001
Constipation	31.8±19.4	25.6±17.2	0.037	32.5±18.7	31.2±18.3	0.318	0.024
Diarrhea	23.9±17.8	19.5±16.3	0.124	24.2±18.2	23.4±17.8	0.392	0.062
Financial difficulties	43.5±27.1	38.9±25.2	0.145	42.8±26.4	41.5±25.8	0.473	0.154

Figure 2: Changes in quality-of-life scores from baseline to post-intervention.

Table 4: Changes in EORTC QLQ-BR23 scores from baseline to post-intervention

EORTC QLQ-BR23 Scale	Intervention Group (n=64)			Control Group (n=60)			Between-group P-value
	Baseline	Post-intervention	P-value	Baseline	Post-intervention	P-value	
Functional scales							
Body image	62.3±18.7	76.2±16.5	<0.001	63.1±19.2	65.2±18.7	0.156	<0.001
Sexual functioning	52.1±23.4	59.5±21.8	0.001	51.5±24.1	53.1±23.5	0.276	0.008
Sexual enjoyment*	48.3±26.7	52.6±25.1	0.106	47.9±27.3	49.3±26.5	0.368	0.035
Future perspective	47.8±22.5	63.0±19.6	<0.001	48.2±21.9	50.3±21.2	0.184	<0.001
Symptom scales							
Systemic therapy side effects	58.7±19.3	43.9±17.8	<0.001	57.9±18.7	55.4±18.2	0.087	<0.001
Breast symptoms	42.6±20.5	31.3±18.2	<0.001	43.1±19.8	41.5±19.3	0.214	<0.001
Arm symptoms	38.9±18.3	29.2±16.7	<0.001	39.5±17.9	38.1±17.5	0.304	<0.001
Upset by hair loss	71.2±24.5	58.7±22.1	<0.001	70.8±23.9	68.4±23.2	0.143	<0.001

*Only patients who were sexually active were evaluated for sexual enjoyment (intervention group: n=35; control group: n=32) ; Only patients who experienced hair loss were evaluated (intervention group: n=57; control group: n=53)

Table 5: Changes in psychological status from baseline to post-intervention

Psychological Parameter	Intervention Group (n=64)			Control Group (n=60)			Between-group P-value
	Baseline	Post-intervention	P-value	Baseline	Post-intervention	P-value	
HADS-Anxiety score	9.3 ± 4.1	5.1 ± 3.7	<0.001	9.1 ± 4.3	8.5 ± 4.1	0.054	<0.001
Patients with anxiety (HADS-A ≥8)	34 (53.1%)	16 (25.0%)	<0.001	31 (51.7%)	29 (48.3%)	0.362	<0.001
HADS-Depression score	8.7 ± 3.9	5.0 ± 3.5	<0.001	8.5 ± 4.2	8.1 ± 4.0	0.089	<0.001
Patients with depression (HADS-D ≥8)	31 (48.4%)	14 (21.9%)	<0.001	28 (46.7%)	26 (43.3%)	0.371	<0.001
PSS-10 score	23.8 ± 5.7	18.7 ± 5.1	<0.001	23.5 ± 6.1	22.8 ± 5.9	0.083	<0.001

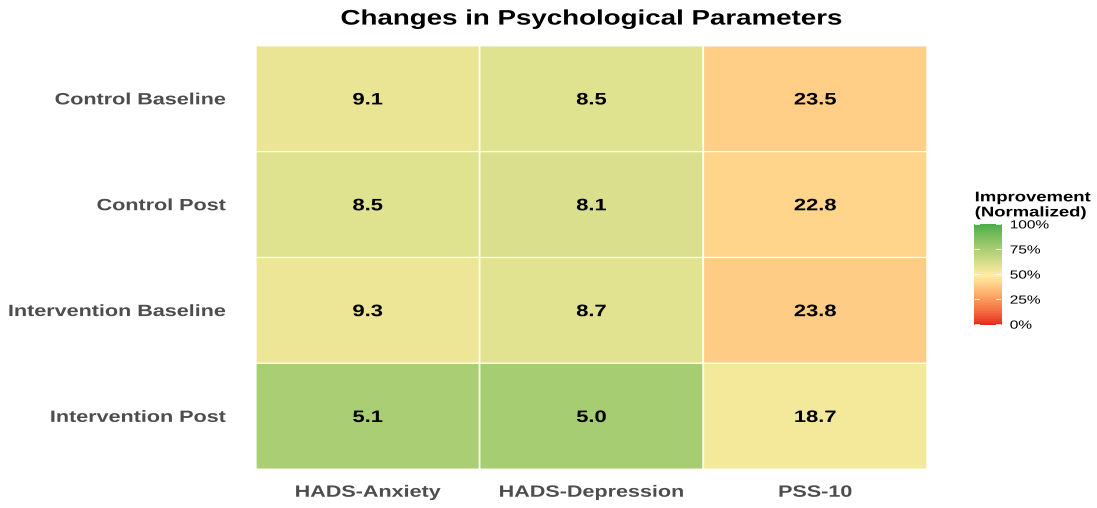

Figure 3: Heat map visualization of changes in psychological parameters from baseline to post-intervention.

Table 6: Comparison of chemotherapy-related adverse events between the intervention and control groups

Adverse event	Intervention Group (n=64)	Control Group (n=60)	P-value
Myelosuppression			
Any grade neutropenia	43 (67.2%)	47 (78.3%)	0.034
Grade 3-4 neutropenia	10 (15.6%)	16 (26.7%)	0.027
Febrile neutropenia	5 (7.8%)	10 (16.7%)	0.031
Duration of neutropenia (days)	4.3±1.8	5.8±2.1	0.003
G-CSF usage (injections per patient)	2.1±1.4	3.2±1.6	<0.001
Grade 3-4 thrombocytopenia	6 (9.4%)	10 (16.7%)	0.041
Grade 3-4 anemia	5 (7.8%)	8 (13.3%)	0.053
Gastrointestinal toxicity			
Grade 2-4 nausea/vomiting	18 (28.1%)	25 (41.7%)	0.012
Grade 2-4 diarrhea	11 (17.2%)	14 (23.3%)	0.137
Grade 2-4 constipation	14 (21.9%)	18 (30.0%)	0.079
Grade 2-4 mucositis	8 (12.5%)	11 (18.3%)	0.108
Other toxicities			
Grade 2-4 fatigue	22 (34.4%)	29 (48.3%)	0.015
Moderate-to-severe peripheral neuropathy	15 (23.4%)	22 (36.7%)	0.021
Elevated liver enzymes (>2.5 ULN)	9 (14.1%)	12 (20.0%)	0.098
Skin reactions (grade 2-4)	6 (9.4%)	8 (13.3%)	0.215
Infections (excluding FN)	10 (15.6%)	14 (23.3%)	0.077
Hair loss (any grade)*	57 (89.1%)	53 (88.3%)	0.555

*ULN = upper limit of normal; FN = febrile neutropenia

Chemotherapy-related adverse events

The intervention group experienced fewer and less severe chemotherapy-related adverse events compared to the control group. The incidence of grade 3-4 myelosuppression was significantly lower in the intervention group (15.6% vs. 26.7%, P=0.027), as was the incidence of febrile neutropenia (7.8% vs. 16.7%, P=0.031). The mean duration of neutropenia was also shorter in the intervention group (4.3±1.8 days vs. 5.8±2.1 days, P=0.003).

The mean G-CSF usage was lower in the intervention group than in the control group (2.1±1.4 vs. 3.2±1.6 injections per patient, P<0.001). Other notable differences included lower rates of grade 2-4 nausea/vomiting (28.1% vs. 41.7%, P=0.012), grade 2-4 fatigue (34.4% vs. 48.3%, P=0.015), and moderate-to-severe peripheral neuropathy (23.4% vs. 36.7%, P=0.021) in the intervention group compared to the control group. Table 6.

Discussion

This study investigated the effects of comprehensive psychological intervention combined with traditional Chinese medicine (TCM) external therapy on treatment adherence and quality of life in breast cancer patients during chemotherapy. The results demonstrated that the integration of comprehensive psychological intervention and TCM external therapy into standard chemotherapy and routine care significantly improved patients' chemotherapy completion and dose intensity achievement rates, reduced rates of chemotherapy delay and regimen modification, enhanced overall quality of life, and alleviated psychological distress.

The results indicate that patients in the intervention group exhibited higher chemotherapy completion rate and dose intensity achievement rate, as well as lower chemotherapy delay rate and regimen modification rate. Cancer patients often experience adherence issues during chemotherapy, including delayed treatment, reduced dosage, or premature termination of treatment, which are closely associated with poor prognosis[19]. A 20-year follow-up study of early breast cancer patients found that patients receiving CMF regimen with relative dose intensity (RDI) ≥85% had significantly higher survival rates than those with RDI <85% [20]. That study showed that for patients receiving TEC

regimen, 85% was the critical threshold for overall survival, while 80% was the critical threshold for disease-free survival.

In this study, mindfulness training helped patients accept their current experiences and reduce fear and resistance to chemotherapy; cognitive behavioral therapy changed patients' negative cognitions about chemotherapy and enhanced confidence in treatment efficacy; supportive group psychotherapy provided a platform for emotional support and experience sharing, reducing feelings of loneliness and helplessness. These findings are consistent with Ashton et al.'s research, which found that cognitive behavioral therapy, mindfulness-based interventions, and meaning-centered psychotherapy were effective in alleviating distress and improving quality of life in breast cancer patients[21].

The role of TCM external therapy in improving treatment adherence has not been widely studied, and this research provides new evidence for this. TCM external therapies such as moxibustion and acupoint application indirectly increased patients' willingness to continue treatment by alleviating chemotherapy-related discomfort symptoms such as nausea, vomiting, and fatigue. Additionally, TCM theory suggests that these interventions enhance patients' physical resistance by regulating qi and blood circulation, balancing yin and yang, and tonifying the spleen and kidneys, enabling them to better tolerate chemotherapy[16].

This study used EORTC QLQ-C30 and QLQ-BR23 scales to assess the quality of life of breast cancer patients, with results showing significant improvements in overall health status, functional domains, and symptom relief in the intervention group. Within the functional domains, improvements in emotional function and social function were particularly notable in the intervention group. This is likely directly related to the focus of comprehensive psychological intervention. Mindfulness training reduced anxiety and depression by promoting awareness and acceptance; cognitive behavioral therapy improved patients' perception of their condition by restructuring negative cognitive patterns related to illness and treatment; supportive group psychotherapy enhanced social support networks and interpersonal connections. These results are consistent with Badaghi *et al*.'s research, which found that mindfulness interventions had significant effects on various positive health outcomes in cancer patients, including improved positive emotional states and coping abilities[22].

TCM theory holds that chemotherapy-related symptoms in breast cancer are closely associated with qi and blood deficiency, spleen and stomach dysfunction, and liver and kidney yin deficiency. The external therapies used in this study, such as moxibustion, acupoint application, and herbal fumigation, improved symptoms by stimulating specific acupoints and meridians, regulating organ functions, and restoring qi and blood balance[23]. For example, stimulation of acupoints such as Zusanli (ST36) and Sanyinjiao (SP6) can strengthen the spleen, boost qi, and regulate qi and blood; Neiguan (PC6) and Zhongwan (CV12) can harmonize the stomach, suppress counterflow, and stop vomiting; while Ganshu (BL18) and Shenshu (BL23) can nourish the liver and kidneys and nourish yin to suppress yang. Compared to existing research, this study innovatively combined psychological intervention with TCM external therapy to form a complementary and synergistic comprehensive intervention model. This integration not only addressed patients' psychological health but also emphasized the relief of physical symptoms, reflecting an integrated mind-body treatment philosophy.

The results of this study show that anxiety, depression, and stress levels in patients in the intervention group were significantly improved, with notable reductions in the incidence of anxiety and depression. Breast cancer patients often experience severe psychological distress during chemotherapy, with research reporting that approximately 40-60% of patients exhibit clinically significant anxiety or depression symptoms [24,25]. In this study, mindfulness training reduced patients' worries about the future and regrets about the past by enhancing present-moment awareness and acceptance. Modern neuroscience research indicates that mindfulness practice can change brain structure and function, enhancing the prefrontal cortex's ability to regulate emotional responses[26,27]. Cognitive behavioral therapy helped patients establish more positive and rational cognitive patterns by identifying and challenging negative automatic thoughts. Supportive group psychotherapy reduced patients' feelings of loneliness and helplessness through peer support and

emotional expression. The mechanisms by which TCM external therapy improves patients' psychological status may include: indirectly reducing psychological pressure by alleviating physical discomfort symptoms; TCM theory holds that specific acupoints (such as Shenmen (HT7) and Neiguan (PC6)) have calming, anxiety-relieving, and depression-alleviating effects that can directly regulate psychological status [28, 29].

This study has several limitations. First, the sample size is relatively small, which may limit the generalizability of the findings; future studies should aim to include larger and more diverse populations. Second, the follow-up duration was short, thus precluding a comprehensive assessment of long-term treatment efficacy. Third, due to the nature of the interventions, complete double-blinding was not feasible, potentially introducing subjective bias. Fourth, the study did not isolate the individual effects of psychological intervention and traditional Chinese medicine (TCM) external therapy, making it difficult to determine the specific contribution of each component. Finally, the complexity of the intervention protocol may pose implementation challenges in healthcare settings with limited resources.

In conclusion, this study demonstrates that comprehensive psychological intervention combined with TCM external therapy can effectively improve chemotherapy adherence, enhance quality of life, alleviate psychological distress, and reduce chemotherapy-related adverse reactions in breast cancer patients. This innovative integrated intervention model provides new ideas and empirical evidence for supportive care during breast cancer chemotherapy and is worthy of clinical application. Future research should focus on the long-term effects of the intervention, mechanisms of action, and clinical implementation strategies to further optimize comprehensive management models for breast cancer.

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Authors' contributions

XiaoNi Wang contributed to the study design, data collection, and manuscript writing. Chen Gao participated in the implementation of psychological interventions and statistical analysis. Suisheng Yang was responsible for the application of TCM external therapies and clinical evaluations. Juan Wang supervised the entire research process, provided critical revisions, and finalized the manuscript. All authors reviewed and approved the final version of the manuscript.

Conflict of interest statement

The authors declare no competing interests.

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