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ARTICLE

Effect of Personalized Nutrition Combined with Acceptance and Commitment Therapy on Psychological Resilience, Quality of Life and Side Effects of Chemotherapy in Patients with Advanced Gastric Cancer

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Abstract

Aims/Background Gastric cancer is a common and life-threatening cancer, which predisposes patients to certain psychological problems. Implementation of both personalized nutrition and acceptance and commitment therapy (ACT) have shown unique advantages in the treatment of cancer patients. This study aims to evaluate the effects of this comprehensive therapy on psychological resilience, quality of life and side effects of chemotherapy in patients with advanced gastric cancer (AGC), yielding findings that can inform the development of holistic and effective treatment methods.

Methods The clinical data of 240 AGC patients who underwent chemotherapy in the Fourth Hospital of Hebei Medical University from February 2021 to February 2023 were retrospectively analyzed. After excluding 15 patients who did not meet the inclusion criteria, 225 patients were included in the study. According to the management methods, the patients were divided into three groups: group A receiving routine management (n = 76), group B receiving routine management plus personalized nutrition (n = 75), and group C receiving routine management, personalized nutrition and ACT (n = 74). The psychological resilience, quality of life and side effects of chemotherapy were evaluated in the three groups.

Results There was no difference in the Connor-Davidson resilience scale (CD-RISC) scores and quality of life questionnaire-core 30 (QLQ-C30) scores among the three groups at admission ($p > 0.05$). After chemotherapy, compared with the group C, the CD-RISC scores of group A and group B were significantly lower ($p < 0.001$), and the scores of physical function, cancer-related symptoms and overall health in group A and group B were significantly lower ($p < 0.001$). The incidence of side effects of chemotherapy in group C was 25.68%, which was significantly lower than that in group A and group B ($p < 0.05$); there was no statistical difference in this regard between group A and group B ($p > 0.05$), and the same parameter was significantly different between group A and group C ($p < 0.05$).

Conclusion Personalized nutrition management plus ACT has a significant favorable effect on improving psychological resilience, alleviating the side effects of chemotherapy, and enhancing the quality of life in patients with AGC undergoing chemotherapy.

Key words: gastric cancer; acceptance and commitment therapy; nutrition support; psychological resilience; quality of life

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Introduction

Gastric cancer (GC) is the fifth most frequently diagnosed cancer in the world and the third most common cause of cancer death (Bray et al, 2018). Despite the 5-year survival rate of early GC exceeding 90%, most patients may develop advanced gastric cancer (AGC) on account of delayed diagnosis (Tan, 2019). The most common mode of surgical treatment for GC is minimally invasive gastrectomy. Compared with implementing surgery only, applying preoperative or postoperative adjuvant chemotherapy can improve survival rate of patients (Ilson, 2019).

It is worthy to note that cancer patients are vulnerable to malnutrition due to increased nutrient consumption (Viana et al, 2020). In addition, reduced gastric volume after surgery and chemotherapy-induced side effects such as vomiting and diarrhea (Yang et al, 2020) would further increase the incidence of malnutrition in AGC patients. Nutritional status is closely associated with treatment outcome and rehabilitation process of cancer patients, and is of great significance for the quality of life of AGC patients (Nguyen et al, 2021). Nutritional intervention methods should be timely adjusted and modified to optimize personalized nutrition plan for patients due to (i) the nutrient-consuming nature of carcinogenesis process, (ii) the necessity to receive chemotherapy, (iii) the difficulty faced by cancer patients during fasting, (iv) the continuous changes in nutritional status during treatment (Qiu et al, 2020). Moreover, cancer-related fatigue and psychological shifts occur easily due to relatively long course of disease and treatment cycle among AGC patients (Liu et al, 2022), which has a certain effect on treatment compliance. Acceptance and commitment therapy (ACT), the third generation of mindfulness-based behavioral therapy (Godfrey et al, 2020), is a form of treatment for reducing experiential avoidance by increasing psychological flexibility (LaRowe et al, 2022). A randomized controlled trial of metastatic breast cancer found that ACT showed credibility and promise in improving fatigue and sleep-related outcomes (Mosher et al, 2020). Over the years, personalized nutrition combined with ACT in patients with AGC has gradually attracted attention, but the relevant clinical studies were scarce. Hence, this retrospective study explored the effect of this method on patients' psychological resilience, quality of life and side effects of chemotherapy.

Methods

Study Subjects

A total of 240 AGC patients undergoing chemotherapy in the Fourth Hospital of Hebei Medical University from February 2021 to February 2023 were selected. A total of 15 patients were excluded from this study, including 3 patients with other unhealed tumors, 2 patients who terminated chemotherapy treatments due to severe side effects, 4 patients who had received chemotherapy for <2 weeks, and 6 patients with incomplete clinical data. Finally, 225 patients were included in the study. According to the management methods, the patients were divided into three groups: group A receiving routine management ($n = 76$), group B receiving routine management plus personalized nutrition ($n = 75$), and group C receiving routine

management, personalized nutrition and ACT (n = 74). The flow chart of the study is shown in Fig. 1.

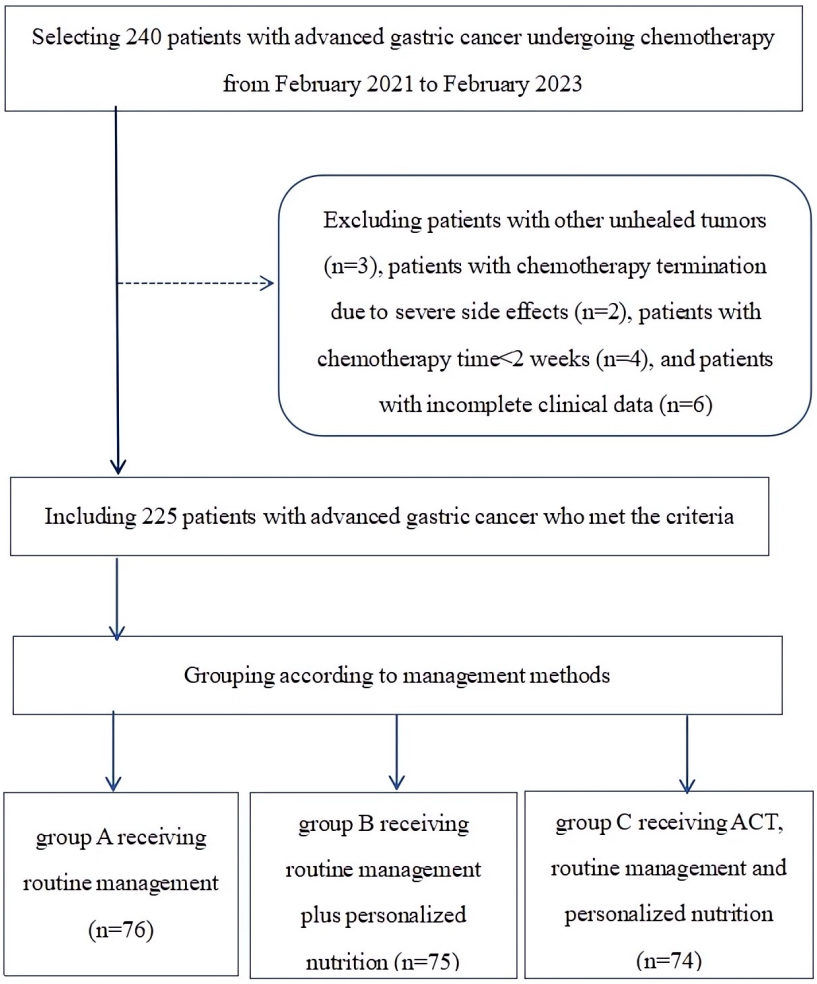

Fig. 1. Flow chart depicting the inclusion and categorization of subjects. ACT, acceptance and commitment therapy.

Inclusion and Exclusion Criteria

Inclusion Criteria

The subjects who met the following criteria were included: (1) patients who aged >18 years; (2) patients with clear and complete medical records; (3) patients who had no severe disease in heart, lung, liver and kidney; and (4) patients with a predicted survival time of >3 months.

Exclusion Criteria

The subjects who met the following criteria were excluded: (1) patients afflicted with other tumors; (2) patients who was undergoing chemotherapy, ceased to receive chemotherapy due to severe side effects, or adopted other treatment meth-

ods due to disease progression; (3) patients who had primary tumors in other organs; and (4) patients who had received chemotherapy for less than 2 weeks.

Management Methods

Patients in group A received routine management, starting from admission until discharge. After admission, patients' disease conditions, physical conditions, disease awareness, and psychological states were comprehensively evaluated as health indicators. During chemotherapy, patients' emotional states were observed timely so that proper guidance could be offered to patients to confront the disease with the right mentality. The adverse reactions that might occur during radiotherapy were explained to patients, who were also informed of the measures to prevent oral ulcers and vomiting. At the same time, the adverse reactions of patients during chemotherapy were observed and reported to the physicians in time.

Routine management and personalized nutrition management were implemented in group B. Details about personalized nutrition management are shown in Table 1. Patients in group C received routine management, personalized nutrition management and ACT, which was administered 30–40 min/time and 3 times/week. Details about ACT are shown in Table 2.

Study Variables

Baseline Information

Baseline data of patients were collected from the medical record system of the Fourth Hospital of Hebei Medical University, including age, sex, body mass index (BMI), course of disease, chemotherapy cycle, tumor node metastasis (TNM) stage, lesion location (stomach body, antrum and pylorus, and cardia and gastric fundus), pathological classification, number of distant metastasis sites, lymph node metastasis, drinking history, smoking history, diabetes history, and hypertension history.

Psychological Resilience

Connor-Davidson resilience scale (CD-RISC) was used to assess psychological resilience of patients, and the scores were collected at admission and after chemotherapy. This scale includes 25 items (Connor and Davidson, 2003) in three dimensions: self-confidence (13 items), tenacity (8 items), and optimism (4 items). These items were rated using 5-point Likert score (0 = completely incorrect, and 4 = almost always correct), and the total score ranges from 0 to 100. A higher score indicates better psychological resilience. The Chinese version of the scale was revised by Wu et al (2017), and Cronbach's α coefficient was 0.91.

Quality of Life

The quality of life questionnaire-core 30 (QLQ-C30) developed by the European Organization for Research and Treatment of Cancer (EORTC) was employed to evaluate the quality of life of patients. The QLQ-C30 scores at admission and after chemotherapy were collected. The questionnaire has 30 questions covering physical function (physical, role, cognitive, emotional and social), cancer-related symptoms (fatigue, pain and nausea/vomiting, dyspnea, insomnia, anorexia, consti-

Table 1. Personalized nutrition management.

Items	Specific contents
Establishment of the professional management group	The team consisted of experienced nursing staff, nurses in the nutrition department and a head nurse to carry out professional training for team members, so that they could understand the main contents of personalized nutrition management. Then, the nutritional status of patients was scientifically evaluated at admission, and the nutritional plans were formulated based on the patients' eating habits, food pyramid and nutrition and management guidelines for cancer patients issued by The European Society for Clinical Nutrition and Metabolism (Arends et al, 2017). Meanwhile, before chemotherapy, the precautions in chemotherapy and the importance of nutritional balance were explained to patients and their families through video demonstrations, health lectures, and WeChat sharing of health knowledge tidbits.
Personalized nutrition management	(1) Patients with normal digestion and diet were given a standard diet to maintain dietary balance but imposed a strict control of daily sodium intake to avoid water and sodium retention. (2) Patients with poor digestion received a liquid or semi-liquid diet, and patients who could not chew food received enteral or parenteral nutrition support three times a day, and feeding instructions were constantly explained to reduce the incidence of feeding problems. (3) Patients with anorexia, nausea and vomiting were instructed to take multiple meals but with a small amount of food each time. The food temperature was reasonably adjusted to ensure that the interval between chemotherapy and eating exceeded 3 hours. (4) For patients with gastrointestinal reactions, the food for strengthening the spleen and promoting appetite was supplemented to alleviate gastrointestinal reactions, thus ensuring nutritional supply during chemotherapy. (5) This management mode also entailed a dynamic evaluation of nutritional risk for patients, once a week. The attending doctor and dietitian were timely informed of the evaluation results, so that they could promptly make appropriate adjustments to the nutrition plans and objectives. Meanwhile, scientific and comprehensive emergency plans were developed based on relevant literature retrieved from databases, combined with previous clinical experience. These plans were implemented immediately as soon as patients experienced physical symptoms or malnutrition.

pation and diarrhea), and overall health. Each of the questions concerning physical function and cancer-related symptoms was rated from 1 (never) to 4 (always), while that for overall health was rated from 1 (very poor) to 7 (excellent). After patients completed the questionnaire survey, the original scores of each field were recorded and then converted to standard scores ranging from 0 to 100. Higher scores in the domains of overall health and physical function indicate better quality of life, while higher scores in cancer-related symptoms reflect poorer quality of life (Aaronson et al, 1993). The Cronbach's α coefficient of QLQ-C30 was 0.81–0.92 (Osoba et al, 1997).

Table 2. Acceptance and commitment therapy.

Items	Specific contents
Establishment of team	The team members received professional training to learn and master the relevant theoretical knowledge about the process and treatment of ACT, with a focus on acceptance, cognitive defusion, experience of the present moment, situational selves, construction of values and commitment activity. The main goal of the training was to prove that the team members could successfully pass the related assessment.
Acceptance	Patients should accept that they would become ill, and understand that the meaning of acceptance is contrary to tolerance, actively facing the discomforts of cancer and chemotherapy with a subjective mindset. In addition, patients were told that disease is part of life experience, so that they would gradually develop a positive perception, which helped them objectively confront the negative impact of bad emotions and courageously accept the cancer becoming part of their lives.
Cognitive defusion	The team members guided patients to express their real thoughts so as to explore their inner worries and fears such as anxiety about death, to clearly distinguish between actual situations and self-thoughts, and to discuss their negative emotions and the observed surroundings together. These actions serve to ultimately inform patients that the fears they were facing have not yet occurred, and to assist patients dealing with cancer and chemotherapy foster an optimistic attitude.
Experience of the present moment	The team members encouraged the patients to put aside their attention to the past, focus on the current mood and situation with a positive mindset, and accept the current reality. Patients should carry out meditation-relaxation training to practice on their thinking process and concentration, in order to relax their body and spirit and calm their moods.
Situational selves	It was necessary to encourage patients to accept the fact that they had GC; comprehend themselves through mindfulness decompression; pay active attention to self-emotion, thinking and behavior changes; expedite the process of accepting themselves; and promote cognitive dissociation. At the same time, the patients were guided to recall the pleasant events in the past, and reflect on the individual role in the situation, so as to enhance the concerted effects of disease treatment and rehabilitation.
Construction of values	In this step, the patients were told that the existing treatments for GC have attained progressive strides. Adjuvant chemotherapy after radical gastrectomy of GC is a widely used method for the clinical treatment of GC, which significantly prolongs the survival of patients. In the meantime, cases depicting successful treatment and recovery were shared with the patients, promoting the patients to imagine the life after recovery. The patients were also guided to identify their life goals, clarify the directions, and foster confidence toward efficacy of the treatment received through question-and-answer sessions.
Commitment activity	According to patients' values and life goals, practical plans were developed. The seminars were performed regularly to encourage free sharing by patients, especially in topics concerning treatment experiences, and to heighten their enthusiasm to interact with families, so that they could feel the warmth of the family and re-establish confidence in life.

GC, gastric cancer.

Side Effects of Chemotherapy

The occurrence of anorexia, constipation, vomiting, diarrhea and alopecia in the patients of the three groups was recorded, and the incidence was calculated and compared:

Incidence (%) = Number of cases with symptoms/Number of patients in each group × 100.

Statistical Analysis

The clinical data collected in the study were processed using SPSS 26.0 software (IBM, Armonk, NY, USA). The categorical variables were analyzed by chi-square test. Data of categorical variables are expressed as counts and percentages. Shapiro-Wilk test was used to test whether the data of continuous variables conformed to the normal distribution. The normally distributed data are expressed as mean ± standard deviation (SD). Variance analysis was used to test the differences between multiple variables, and the results obtained are expressed as F values. N-K test was further used for pairwise comparison within the group. Data of continuous variables that do not conform to the normal distribution are expressed as median (P_{25}, P_{75}). Kruskal-Wallis test was used to test the differences among the three groups; the results were expressed as H values, and Bonferroni method was utilized for pairwise comparison within the group. The difference was considered statistically significant at $p < 0.05$. WPS Office Excel (version 2021; Jinshan Software Co., Ltd., Beijing, China) was used to draw Fig. 1.

Results

Comparison of Baseline Data

There was no significant difference in baseline data among the three groups ($p > 0.05$), as shown in Table 3.

Comparison of Psychological Resilience

According to Table 4, there was no significant difference in CD-RISC scores among the three groups at admission ($p > 0.05$); however, after chemotherapy, CD-RISC scores were significantly lower in group A and group B than in group C ($p < 0.001$).

Comparison of Quality of Life

There was no difference in QLQ-C30 scores among the three groups at admission ($p > 0.05$). After chemotherapy, the scores of physical function, cancer-related symptoms and overall health in group A and group B were significantly lower than those in group C ($p < 0.001$), as shown in Table 5.

Comparison of Side Effects of Chemotherapy

As shown in Table 6, compared with group A and group B, the incidence of side effects of chemotherapy in group C was significantly lower ($p < 0.05$), and the odds of side effects of chemotherapy were similar in group A and group B ($p > 0.05$).

Table 3. Comparison of baseline data among the three groups.

Items	Group A (n = 76)	Group B (n = 75)	Group C (n = 74)	H/χ^2	*p*
Age (years)	57.00 (53.00, 63.75)	59.00 (51.00, 64.00)	55.00 (50.00, 63.25)	1.633	0.442
Sex				0.013	0.994
Male	50 (65.79)	50 (66.67)	49 (66.22)		
Female	26 (34.21)	25 (33.33)	25 (33.78)		
BMI (kg/m^2)	21.52 (20.77, 22.39)	21.72 (21.00, 22.75)	21.93 (21.28, 22.77)	4.801	0.091
Course of disease (months)	10.00 (8.00, 11.75)	10.00 (8.00, 12.00)	9.00 (7.00, 11.25)	1.085	0.581
Chemotherapy cycle				0.547	0.761
2 weeks	48 (63.16)	43 (57.33)	44 (59.46)		
>2 weeks	28 (36.84)	32 (42.67)	30 (40.54)		
TNM stage				0.513	0.774
IIIc	39 (51.32)	35 (46.67)	34 (45.95)		
IV	37 (48.68)	40 (53.33)	40 (54.05)		
Lesion location				1.115	0.892
Stomach body	28 (36.84)	32 (42.67)	27 (36.49)		
Antrum and pylorus	26 (34.21)	21 (28.00)	23 (31.08)		
Cardia and gastric fundus	22 (28.95)	22 (29.33)	24 (32.43)		
Pathological classification				0.506	0.973
Adenocarcinoma	35 (46.05)	37 (49.33)	34 (45.95)		
Signet-ring cell carcinoma	21 (24.63)	19 (25.33)	21 (28.39)		
Small cell carcinoma	20 (26.32)	19 (25.33)	19 (25.68)		
Number of distant metastasis sites				0.509	0.775
1	56 (73.68)	54 (72.00)	57 (77.03)		
≥2	20 (26.32)	21 (28.00)	17 (22.97)		
Lymph node metastasis				1.060	0.589
Yes	27 (35.53)	22 (29.33)	21 (28.38)		
No	49 (64.47)	53 (70.67)	53 (71.62)		
Drinking history				0.997	0.607
Yes	58 (76.32)	54 (72.00)	53 (71.62)		
No	18 (23.68)	21 (28.00)	21 (28.38)		
Smoking history				0.779	0.677
Yes	56 (73.68)	53 (70.67)	57 (77.03)		
No	20 (26.32)	22 (29.33)	17 (22.97)		
Diabetes history				0.086	0.958
Yes	28 (36.84)	26 (34.67)	26 (35.14)		
No	48 (63.16)	49 (65.33)	48 (64.86)		
Hypertension history				0.972	0.615
Yes	30 (39.47)	25 (33.33)	24 (32.43)		
No	46 (60.53)	50 (66.67)	50 (67.57)		

Data of categorical variables are expressed as counts and percentages, whereas data of continuous variables that do not conform to the normal distribution are expressed as median (P_{25}, P_{75}).

Abbreviation: BMI, body mass index; TNM, tumor node metastasis.

Discussion

Surgical treatment is the prime option for patients with GC at early stage; however, the condition in most patients has usually progressed to middle and late stages because of delayed diagnosis, necessitating chemotherapy as the vital treatment since surgical treatment would have limited therapeutic effect (Machlowska et al, 2020). Unfortunately, chemotherapy drugs are cytotoxic to normal cells and trigger a series of unwanted side effects, such as anorexia, constipation, vomiting, diarrhea, and alopecia, while killing cancer cells (Saad et al, 2019). Altogether, these eventually result in severe malnutrition, which affects the patients' psychological states and reduces their quality of life, so the early implementation of nutrition and mindfulness intervention is essential.

Clinical studies on personalized nutrition plus ATC in AGC patients remain scarce. This study aimed to investigate the effects of different intervention measures on patients with AGC undergoing chemotherapy, especially in improving psychological resilience, reducing side effects of chemotherapy and enhancing quality of life. Psychological resilience is an individual ability to cope with and overcome trauma and stressful events effectively and positively, and also serves as a protective psychological mechanism that enables patients to cope with major adversity, such as cancer diagnosis (Velickovic et al, 2020). Mohlin et al (2021) found that higher psychological resilience is a crucial factor for maintaining a better quality of life. According to Ghorbani et al (2021), the implementation of ACT could relieve depression level, increase pain acceptance and psychological flexibility in breast cancer patients. In a separate study, Karimi et al (2022) showed that ACT enhanced psychological resilience and quality of life in patients with multiple sclerosis. The study results showed that the scores of CD-RISC and self-confidence, tenacity and optimism were generally low in the three groups before management, and these scores were improved in group C after personalized nutrition management, ACT and routine management, exceeding those in group A and group B. The present results are similar to the findings of the two studies mentioned. Adjuvant chemotherapy is usually indicated for patients with AGC, but long-term treatment would cause cancer-related fatigue and altered psychological states. In this study, we recommended guiding patients to embrace the disease and chemotherapy through ACT, so that patients regard disease as an object, thus reducing subjective evaluation and escape, and connecting with their values to increase their resilience. In the meantime, on this basis, commitment and behavior changes were implemented to encourage patients to gradually adapt to the physical changes di-

Table 4. Comparison of CD-RISC scores among the three groups.

Groups	At admission				After chemotherapy			
	Self-confidence	Tenacity	Optimism	Total score	Self-confidence	Tenacity	Optimism	Total score
Group A (n = 76)	26.50 (23.00, 29.75)	17.00 (15.00, 19.00)	6.00 (5.00, 7.00)	50.00 (46.25, 53.00)	25.00 (22.00, 28.00)	19.00 (17.00, 21.00)	8.00 (7.00, 10.00)	51.50 (50.00, 55.00)
Group B (n = 75)	25.00 (21.00, 28.00)	17.00 (15.00, 19.00)	7.00 (6.00, 7.00)	49.00 (45.00, 52.00)	28.00 (25.00, 31.00)*	20.00 (18.00, 22.00)*	9.00 (8.00, 11.00)*	58.00 (54.00, 61.00)*
Group C (n = 74)	25.00 (21.00, 28.00)	17.00 (14.00, 20.00)	7.00 (6.00, 8.00)	48.00 (44.00, 52.00)	31.00 (28.00, 33.00)	21.50 (19.00, 23.25)#‡	11.00 (9.00, 12.00)#‡	63.00 (59.00, 66.00)#‡
H	5.479	0.413	1.770	3.167	73.514	28.239	56.020	107.192
p	0.065	0.813	0.413	0.205	<0.001	<0.001	<0.001	<0.001

Data of continuous variables that do not conform to the normal distribution are expressed as median (P_{25}, P_{75}).
*$p < 0.05$ indicated a significant difference between group A and group B; # $p < 0.001$ indicated a significant difference between group A and group C; ‡ $p < 0.001$ indicated a significant difference between group B and group C.
Abbreviation: CD-RISC, Connor-Davidson resilience scale.

Table 5. Comparison of QLQ-C30 scores among the three groups.

Groups	Physical function		Cancer-related symptoms		Overall health	
	At admission	After chemotherapy	At admission	After chemotherapy	At admission	After chemotherapy
Group A (n = 76)	55.00 (53.00, 57.75)	59.00 (57.00, 61.00)	54.00 (52.00, 56.00)	59.00 (57.00, 62.00)	55.00 (48.00, 59.75)	59.00 (54.00, 64.00)
Group B (n = 75)	54.00 (52.00, 57.00)	65.00 (61.00, 68.00)*	54.00 (52.00, 57.00)	63.00 (60.00, 66.00)*	54.00 (48.00, 60.00)	66.00 (60.00, 70.00)*
Group C (n = 74)	55.00 (52.00, 59.00)	72.00 (68.00, 74.00)#‡	54.00 (51.75, 57.00)	66.00 (62.75, 71.00)#‡	56.00 (52.00, 61.00)	67.50 (63.00, 75.00)#‡
H	2.079	150.437	0.027	90.687	1.632	52.925
p	0.354	<0.001	0.986	<0.001	0.442	<0.001

Data of continuous variables that do not conform to the normal distribution are expressed as median (P_{25}, P_{75}).
* $p < 0.05$ indicated a significant difference between group A and group B; # $p < 0.001$ indicated a significant difference between group A and group C; ‡ $p < 0.001$ indicated a significant difference between group B and group C.
Abbreviation: QLQ-C30, quality of life questionnaire-core 30.

Table 6. Comparison of side effects of chemotherapy among the three groups.

Groups	Anorexia	Constipation	Vomiting	Diarrhea	Alopecia	Number of cases with side effects	Pairwise comparison		
								χ^2	p
Group A (n = 76)	12 (15.79)	7 (9.21)	6 (7.89)	5 (6.58)	9 (11.84)	39 (51.32)	A&B	1.513	0.219
Group B (n = 75)	14 (18.67)	4 (5.33)	3 (4.00)	4 (5.33)	6 (8.00)	31 (41.33)	A&C	10.393	0.001
Group C (n = 74)	7 (9.50)	3 (4.05)	3 (4.05)	3 (4.05)	3 (4.05)	19 (25.68)	B&C	4.096	0.043
Three-group comparison	χ^2	-	-	-	-	10.458			
	p	-	-	-	-	0.005			

Data of categorical variables are expressed as counts and percentages.

rectly or indirectly caused by the disease and chemotherapy, and to reduce their psychological stress and then strengthen their psychological resilience.

As a multifactorial concept, health-related quality of life is associated with patients' perception in physical, social, psychological and functional fields (Buneviciene et al, 2021). Abdi et al (2023) showed that cancer patients who did not receive any management had poor quality of life, which was notably improved after receiving ACT management. The findings of Yan et al (2023) suggested that personalized nutrition management could lessen fatigue, shortness of breath, and stomach pain, and enhance physical and cognitive functions, as well as quality of life 90 days after gastric cancer surgery. After the implementation of ACT, personalized nutrition and routine management in the present study, the scores of physical function, cancer-related symptoms and overall health in group C were significantly improved, significantly surpassing those in group A and group B and corroborating the results of the above-mentioned studies. Personalized nutrition management is a patient-centered management mode, in which individualized healthy diet plans are formulated according to patients' specific needs, preferences and goals, and their nutritional status is closely and regularly monitored so that adjustments can be made in time to adhere to the goal of improving their nutritional status and physical function (Holdoway et al, 2022). ACT is a new mindfulness-based behavior therapy that guides patients to embrace disease, build a serious and objective perception of their psychological states, foster positive mindset, so as to encourage them to cope with the disease and chemotherapy-induced discomfort with courage. This therapy helps patients to embrace the shifting realities, comply with treatment, and reflect on their life values, and facilitates the smooth return of patients to society, with the ultimate goal of improving their quality of life.

Some AGC patients worry about the side effects of chemotherapy because of the perennial misconception about the disease and diminished confidence in the treatment, which are the common reasons of the incompliance with treatment. Patients who have no intention to escape will gradually foster clearer awareness of the disease and the role of chemotherapy, and are more likely to accept the latest progress of disease-related knowledge and treatment, which is crucial for reducing cancer symptoms and the incidence of complications or side effects of chemotherapy. The study results showed that the incidence of side effects of chemotherapy in group C was 25.68%, which was significantly lower than those in group A and group B. In this study, the implementation of ACT intervened cognition and behaviors of AGC patients, which was beneficial to implement cognitive dissociation, and encourage patients to identify positive and favorable experiences, as well as modulate cognitive function, and actively explore positive psychology, eventually enabling patients to embrace the negative experiences in their lives, and encourage them to relish the moment (Dadashi and Momeni, 2017). In addition, chemotherapy drugs may further affect AGC patients' appetite and digestive function who have poor nutritional status, underscoring the need for personalized nutrition management through which patients are given targeted dietary advice to ensure adequate nutritional intake (Xie et al, 2017). Personalized nutrition plus ACT comprehen-

sively improves the chemotherapy experience of AGC patients from both psychological and nutritional aspects, and further reduces side effects of chemotherapy.

For AGC patients, personalized nutrition management combined with ACT is a promising treatment option, and the long-term benefits of this combination therapy are manifested in several ways. Firstly, the personalized nutritional plans can fulfill the patients' nutritional needs to improve their nutritional status, thus contributing to disease recovery. Secondly, through establishing a positive mindset, ACT improves their confidence and compliance in treatment and guides patients to embrace the disease, thus strengthening their psychological resilience and confidence in surmounting every struggle throughout the recovery process. However, this combination therapy presents several drawbacks. Personalized nutrition management requires professional dietitians to formulate nutrition plans according to the specific conditions of patients while taking into account multiple factors, which further complicate the implementation of this management mode. Moreover, ACT requires self-management ability of patients, which might affect the therapeutic effect if patients do no fully cooperate in the treatment process.

In the realm of nursing care for patients with AGC, the combined application of personalized management and ACT is gradually becoming a major research hotspot. The proposal of this innovative model challenges the traditional treatment mode, and deepens and expands the scope of existing knowledge. The integration of new concepts, methods and technologies enhances the quality of nursing care, improves the patient experience, and further promotes the development of nursing discipline.

Despite the potential positive effect of ACT combined with personalized nutrition management on AGC patients undergoing chemotherapy, this study is not without limitations. Firstly, given the retrospective nature, this study was unable to further validate the validity and reliability of these findings through prospective randomized controlled trials. Future studies may consider designing more rigorous prospective trials to validate the effectiveness of ACT combined with personalized nutrition management in AGC patients undergoing chemotherapy. Secondly, the sample size of this study is relatively small, underlining the need to adopt larger sample in order to yield more accurate findings reflecting the genuine effects of the combined modalities on the AGC patients undergoing chemotherapy. In addition, this study mainly focused on the effects of different management measures on AGC patients experiencing chemotherapy, undercutting the generalizability of the current set of findings to other cancer patient populations. Therefore, future studies are recommended to adopt bigger study sample encompassing patients of other cancer types so as to further explore the broad applicability of this combined management strategy.

Conclusion

Personalized nutrition management combined with ACT significantly improves psychological resilience, reduces the side effects of chemotherapy, and improves the quality of life of AGC patients, and its long-term application in patients with AGC is expected to yield beneficial effects in an overarching manner.

Key Points

- Personalized nutrition plus acceptance and commitment therapy has a positive effect on patients with advanced gastric cancer undergoing chemotherapy.
- Personalized nutrition plus acceptance and commitment therapy improves the psychological resilience of patients with advanced gastric cancer undergoing chemotherapy.
- Personalized nutrition plus acceptance and commitment therapy reduces the occurrence of side effects due to chemotherapy in patients with advanced gastric cancer.
- Personalized nutrition plus acceptance and commitment therapy improves the quality of life of patients with advanced gastric cancer.

Availability of Data and Materials

The corresponding author will provide the data that underpin the study's conclusions with a reasonable application.

Author Contributions

HH, HL and YQ designed the study; all authors conducted the study. HX, YQ and JL collected and analyzed the data. HH and JL participated in drafting the manuscript, and all authors contributed to critical revision of the manuscript for important intellectual content. All authors gave final approval of the version to be published. All authors participated fully in the work, took public responsibility for appropriate portions of the content, and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or completeness of any part of the work are appropriately investigated and resolved.

Ethics Approval and Consent to Participate

This study was conducted in accordance with the Declaration of Helsinki and has been approved by the ethics committee of the Fourth Hospital of Hebei Medical University, approval No. 20241169. The informed consent has been obtained from participants.

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Conflict of Interest

The authors declare no conflict of interest.

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