



Effectiveness of Postoperative Dietary Intervention in Patients with Gastric Cancer who Underwent Gastrectomy: Quasi-Experimental Study Design

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ABSTRACT

Objectives: This article aims to investigate the effects of a postoperative dietary intervention on fatigue, self-efficacy in managing gastrointestinal side effects, self-efficacy for nutritional management, self-care activity, and unmet nursing needs among patients with gastric cancer who have undergone gastrectomy.

Methods: We used a quasi-experimental study design (nonequivalent control group pretest–posttest). Data were collected from 59 patients with gastric cancer (30 in the experimental group and 29 in the control patients) hospitalized for gastrectomy in Daegu, South Korea. The control group completed a preintervention survey, received routine care, and then completed a postintervention survey. After the control group finished their routine care and tests, the experimental group received a postoperative dietary intervention. This intervention included individual face-to-face education and telephone counseling on managing gastrectomy side effects, eating methods to prevent symptoms, foods to avoid, ways to consume sufficient calories, maintaining a balanced diet, and pledge writing. The control group served as a waitlist control. After all interventions and tests for the experimental group were completed, the same dietary intervention was offered to the control group upon their request. This experimental study was conducted from June 2021 to February 2023.

Results: Compared with the control group, the experimental group showed significant improvements in fatigue ($P = .005$), self-efficacy in managing gastrointestinal side effects ($P < .001$), self-efficacy for nutritional management ($P = .03$), self-care activity ($P < .001$), and unmet nursing needs ($P < .001$).

Conclusion: Postoperative dietary interventions contribute to improving self-efficacy, fatigue levels, and self-care activity among patients with gastric cancer.

Implications for Nursing Practice: Upon discharge, implementing a needs-based and loss-framed message-based dietary intervention, alongside routine discharge education, for patients who underwent gastrectomy for gastric cancer can enhance fatigue levels, self-efficacy in managing nutrition and gastrointestinal side effects, self-care activity, and unmet nursing needs.

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Introduction

The incidence of gastric cancer has steadily declined over the past decade; however, it remains prevalent, accounting for 10.8% of all cancer cases. It is the fourth leading cause of cancer-related deaths, contributing to mortality.¹ However, with the increasing early detection of cancer and medical technology advancement, the 5-year relative survival rate for stomach cancer in South Korea has risen to 78.0% between 2016 and 2020.¹ The rising survival rate indicates that cancer is becoming a chronic condition requiring long-term

management.² The primary surgical treatment for gastric cancer is gastrectomy.

Owing to postoperative body changes, patients with cancer often experience physical and psychological symptoms.³ In patients with stomach cancer, late physical complications such as dumping syndrome, indigestion, nausea, vomiting, and diarrhea contribute to weight loss and nutritional deficiencies.⁴ At university and general hospitals, Nutrition Support Teams (NST), composed of physicians, pharmacists⁵, dietitians, and nurses, play a critical role in facilitating the rapid recovery of inpatients through comprehensive nutritional management. However, the implementation of nutritional care remains suboptimal, largely due to healthcare professionals' insufficient knowledge and attitudes toward nutritional support.⁶ In addition, the implementation of a comprehensive fee-for-service system

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Layperson Summary

What we investigated and why

This study focused on the importance of dietary care for stomach cancer patients who have undergone surgery. After surgery, these patients need help with nutrition, managing their diet, and handling side effects. We studied 59 patients in Daegu, South Korea, dividing them into 2 groups: an experimental group that received special dietary instructions and a control group that received regular care.

How we did our research

The control group answered surveys before and after their routine care. The experimental group received detailed dietary guidance, including in-person education and phone counseling on managing side effects, what to eat and avoid, how to get enough calories, and keeping a balanced diet. They also wrote pledges to follow their diet plans. After the control group completed their care and tests, they were also given the option to receive the same dietary guidance.

What we have found

The results showed that the patients who received the special dietary instructions experienced significant improvements. They felt less fatigued, more confident in managing side effects and their nutrition, better at self-care, and more satisfied with their nursing care compared to the control group.

What it means

The conclusion of the study is that personalized dietary plans after stomach cancer surgery greatly benefit patients. These plans help reduce fatigue, boost confidence in handling dietary needs and side effects, and improve self-care and satisfaction with nursing care. Implementing such dietary interventions alongside routine discharge education can significantly enhance recovery and overall well-being for these patients.

Cancer-induced fatigue is more severe and distinct than general fatigue, negatively influencing social and economic aspects of the lives of patients.^{16,17} For patients with gastric cancer, nutritional disorders resulting from gastrectomy are inevitable and associated with fatigue.¹⁸ Considering that the nutritional status of a patient indicates disease prognosis and treatment outcomes, alongside the manifestation of disease-related symptoms and their accompanying side effects, nursing interventions addressing these concerns should be examined.¹⁹

Higher self-efficacy leads to a lower perception of barriers to behavior performance and ultimately influences health-promoting behaviors.²⁰ Self-efficacy significantly influences self-care activities, underscoring the importance of interventions to enhance these activities.²¹ Educational programs that improve self-efficacy in treatment and side-effect management have proven effective.²² Nutritional counseling and education positively influence dietary intake and improve the eating habits of patients.²³ These findings highlight the significance of education as a nursing intervention to enhance the self-efficacy of patients in managing side effects and nutrition.

Furthermore, self-care comprises activities individuals initiate and perform to maintain their health and functions, ensuring ongoing personal development and well-being.²⁴ In patients with cancer, self-care is associated with coping mechanisms, where higher levels of disease awareness and coping skills improve these behaviors.²⁵

Nurses play a crucial role in imparting patients with essential nursing knowledge, educating them on self-management and symptom management, and facilitating the transition from hospital to home.²⁶ However, generic discharge education often overlooks providing individualized, patient-specific education for patients with cancer.

Therefore, this study aimed to verify effective intervention methods to help promote recovery by enhancing the ability to cope with postoperative side effects and promotion management in gastric cancer patients who underwent gastrectomy. Specifically, this study seeks to answer the following research question: What are the effects of the postoperative dietary intervention on unmet nursing needs, fatigue, self-efficacy in managing gastrointestinal side effects, self-efficacy in nutritional management, and self-care activities among gastric cancer patients following gastrectomy?

Materials and Methods

Design

A quasi-experimental (nonequivalent control group pretest–posttest) design was employed in this study to compare fatigue, self-efficacy in managing gastrointestinal side effects, self-efficacy in nutrition, self-care activity, and unmet nursing needs between 2 groups: inpatients who underwent gastrectomy for gastric cancer and a waitlist control group. These comparisons were made before and after implementing a dietary intervention program (Table 1).

Study Setting and Sampling

The study was conducted in the general surgery ward of a comprehensive hospital in Daegu, South Korea, involving inpatients diagnosed with gastric cancer who had undergone gastrectomy.

Inclusion and/or Exclusion Criteria

Inpatients aged ≥ 18 years who underwent their first gastrectomy for gastric cancer and were hospitalized at the general surgery ward of the comprehensive hospital in Daegu were included. Potentially eligible participants meeting these inclusion criteria were invited to participate in the study. Those who voluntarily agreed provided written informed consent after receiving an explanation of the purpose of

and the efforts of the hospital to increase bed turnover rates⁷ have led to a gradual reduction in hospitalization duration. Consequently, patients are often discharged with inadequate education on nutritional requirements.⁸ This consequently shifts the responsibility for health management to the patients and their families. Therefore, educating patients and their families on self-care methods at home and post-discharge management is crucial to mitigate potential issues and support recovery.

Patients undergoing gastrectomy for gastric cancer have specific high nursing needs regarding nutrition, dietary control, and postoperative dietary management.⁹ These patients frequently request counseling on diet and nutrition, as well as information on managing symptoms.¹⁰ However, only a few interventional studies on nutrition education have been conducted for patients with gastric cancer in the past decade.^{9,11} Therefore, effective dietary education is crucial for patients with gastric cancer who have undergone gastrectomy, as identified by their nursing needs. Additionally, more effective and efficient educational strategies are required for these interventions.¹² Message framing is a methodological approach where the construction of messages influences decision-making based on the information type and target audience.¹³ "Loss message framing," which emphasizes the negative outcomes of not complying with health behaviors, has led to positive health behavioral outcomes.^{13–15} Therefore, the current study employed loss message framing as an educational strategy in creating materials for dietary intervention programs.

Table 1
Research Design

| Group | Pretest | Intervention | Posttest | Pretest | Intervention | Posttest |
|--------------------|---------|--------------|----------|---------|--------------|----------|
| Control group | C1 | X1 | C2 | | | |
| Experimental group | | | | E1 | X2 | E2 |

C, control group; E, experimental group; C1, E1, pretest (fatigue, self-efficacy in managing gastrointestinal side effects, self-efficacy for nutritional management, self-care activity, and unmet nursing needs); C2, E2, posttest (fatigue, self-efficacy in managing gastrointestinal side effects, self-efficacy for nutritional management, self-care activity, and unmet nursing needs); X1, discharge education; X2, dietary program and discharge education.

the study. Participants were required to be capable of independently reading and comprehending the questionnaire for the self-administered survey. The first 30 participants were allocated to the control group and the subsequent 30 to the experimental group.

For this study, the sample size was determined using the G*Power 3.1 program, setting an index with a significance level (α) of .05, a power of 0.80 ($1-\beta$), and an effect size of 0.8 (Kang et al., 2016). Based on an independent *t*-test, a minimum sample size of 52 participants (26 per group) was required. Anticipating potential dropouts, 30 participants were selected for each group, totaling 60 participants.

Study Interventions and the Fidelity

The dietary intervention program was developed based on the ADDIE model, which includes 5 phases: Analysis, Design, Development, Implementation, and Evaluation (Branch, 2009).

Analysis

The dietary education program for patients undergoing gastric resection surgery aims to improve their knowledge of postoperative nutrition and treatment processes, enhance their ability to manage side effects and symptoms and reduce fatigue. Based on a literature review, the program aims to decrease postoperative fatigue, increase self-care activity, build confidence in dietary choices, and improve dietary adherence.

The nursing needs of patients with gastric cancer were identified through a review of previous literature, focusing on learning needs related to complications during cancer progression and dietary management.^{27,28} Consequently, the educational materials included explanations and strategies for preventing and managing postoperative complications. For postoperative dietary management, the materials addressed dietary strategies for patients who underwent surgery for gastric cancer, foods to avoid, methods to ensure adequate calorie intake, alternative food choices, and guidance on maintaining a healthy diet.

Design and Development

The dietary intervention consists of 2 components: individualized education provided through a pamphlet and take-home message before discharge (Appendix) and phone counseling after discharge.

To maintain positive health behaviors resulting from our dietary intervention, the program was designed based on self-care^{24,29} and self-efficacy theories.³⁰ In addressing the self-care needs of patients, "education and counseling" were chosen as the intervention approach to impart knowledge about diet for patients with cancer. Participants were encouraged to commit to dietary goals and develop meal plans, which they formalized in a self-written pledge to reinforce their achievements. Since our participants were postoperative inpatients, a concise pamphlet for dietary education was developed. Additionally, telephone follow-up care was implemented to promote the continuity and feasibility of healthy dietary behaviors.

In a short-term intervention, negative messages have been found to be more effective than positive messages³¹ in promoting proper

dietary habits and preventive behaviors to avoid complications. Therefore, the contents of the pamphlet and educational counseling before discharge were structured around "loss-framed messaging." Loss-framed messages emphasize the consequences of attaining a desirable or undesirable outcome. The specific educational content tailored with loss-framed messaging includes potential side effects such as dumping syndrome, malabsorption, indigestion, weight loss, anemia, osteoporosis, and osteopenia. The pamphlet also provides guidance on dietary habits recommended for patients undergoing gastric resection. Lastly, to ensure sustained adherence, prevent relapse of unhealthy behaviors, and promote healthy behaviors, discharge education, and follow-up phone counseling were integrated into the dietary intervention program.

The dietary intervention program comprised 2 parts. Part 1 involved face-to-face sessions conducted before initiating the first diet post-surgery while the patient was still hospitalized. Part 2 commenced 1 week after discharge and included telephone counseling. This phase focused on educating patients about potential side effects, preventive measures, foods to avoid, and recommendations for a balanced diet. The program aimed to reduce fatigue, enhance self-care, build confidence, and improve dietary adherence. The detailed content of the program was listed in Table 2.

To validate the content of the diet intervention program, experts were engaged to review the educational pamphlet and telephone counseling protocol. These experts offered suggestions and recommended modifications to refine the overall program. For the content validity assessment, the dietary education materials and commitment pledges used in the program underwent evaluation by a general surgeon, 1 internal medicine doctor, and 1 oncology nursing professor. They evaluated the content validity index and obtained a value of 0.95, indicating strong validation of the diet intervention program. Subsequently, the program was revised and improved based on the opinions of the experts. After incorporating feedback from the 4 experts on the appropriateness and improvement of the program, the dietary guidance for the target population was ultimately finalized.

Additionally, the program structure was modified and improved based on the following suggestions. Since data on the characteristics of the participants were collected shortly after surgery, and prolonging the education time could cause fatigue, the overall education time was recommended to be reduced from 30 to 20 min.

Implementation

The postgastrectomy dietary intervention program for patients with gastric cancer was implemented in the experimental group by an experienced nurse specialized in nursing practice and research. The experimental group also received routine discharge education.

In this program, personalized patient education was delivered using educational materials from dietary sources before starting the first postoperative diet. Following 1 week after discharge, a follow-up telephone consultation was conducted with all the participants. During these counseling sessions, the nurse assessed how well the participants applied the knowledge gained in the program and addressed

Table 2

Composition of the Postoperative Dietary Intervention for Patients who Underwent Gastrectomy for Gastric Cancer

| Part (duration) | Method | Topic/Goal | Content |
|---|---|---|--|
| Part 1. Before discharge (15 min) | Message framing–based face-to-face counseling for 1 day | Understanding the side effects and coping method | Introduce the program and investigator. Check the symptoms and side effects of gastric cancer (e.g., dumping syndrome, dyspepsia, weight loss, anemia, and osteoporosis). |
| | | Understanding diet to prevent side effects | Check the diet to prevent side effects (e.g., eating small amounts frequently, eating soft foods, taking vitamin supplements, resting while lying on 1 side, consuming special nutritious drinks, and preventing dry mouth). |
| | | Understanding how to avoid food | Check the avoidance of food (e.g., excessive water drinking, consuming food that is too hot or cold, excessive high-fat foods, and excessive sugar). |
| | | Understanding the intake of enough calories | Check how to increase calorie intake to maintain weight (e.g., mixing ingredients and eating snacks). |
| | | Understanding a good diet | Check the 4 principles for the diet of patients with gastric cancer (e.g., consuming high protein, avoiding high fat, taking vitamins from fruits and vegetables, and eating snacks). Check the example of a good diet. |
| Providing a take-home message with a pamphlet | Phone counseling | Self-management | Write a pledge based on the education and health promotion model. |
| Part 2 (5 min) | | Attach the pamphlet to the refrigerator at home to determine the goals and pledges after discharge and 1 week later | Follow up with patients via phone counseling to address any difficulties post-discharge and reinforce the instructions regarding postoperative dietary interventions. |

any questions or concerns they had about the educational content. This approach ensured the effective application of the program and addressed any uncertainties or inquiries from the patients.

Evaluation

A quasi-experimental study was conducted to assess the effectiveness of the dietary intervention program for patients who underwent gastrectomy owing to gastric cancer.

Instrument with Validity and Reliability/ Data Source

Outcomes, such as fatigue, self-efficacy in managing gastrointestinal side effects, self-efficacy in nutritional management, self-care activity, and unmet nursing needs, were measured.

Fatigue

Fatigue was assessed using the 26-item Fatigue Scale for Cancer Patients,³² which comprises 5 domains: physical (6 items), behavioral–social (8 items), emotional (5 items), spiritual (4 items), and cognitive (3 items) factors. Each item is rated on a Likert scale ranging from “Not at all” (1 point) to “Always” (5 points), with higher scores indicating greater fatigue levels. The scale previously demonstrated a Cronbach’s α reliability of 0.95,³² consistent with the findings of the current study.

Self-Efficacy in Managing Gastrointestinal Side Effects

The measurement of self-efficacy in managing gastrointestinal side effects was developed based on the dietary educational materials established in this study. The items focused on symptoms and prevention of dumping syndrome after gastric resection surgery, covering aspects such as maintaining proper weight, preventing anemia, and adhering to dietary guidelines to prevent indigestion, diarrhea, abdominal pain, osteomalacia, and osteoporosis. This scale consists of 13 items. It is a concise and user-friendly tool suitable for evaluating self-efficacy levels in individuals with chronic diseases. Each item is rated on a Likert scale ranging from “Not confident at all” (1 point) to “Extremely confident” (5 points), where higher scores indicate greater self-efficacy in managing gastrointestinal side effects. The scale demonstrated a Cronbach’s α value of 0.90 in this study, and item-total score correlations ranged from 0.64 to 0.85.

Self-Efficacy in Nutritional Management

Self-efficacy in managing nutrition was assessed using the Nutrition Self-efficacy Assessment.³³ Since no Korean version was available, the scale was translated. To ensure semantic equivalence of the translated tool, 2 nurses conducted repeated translation and back-translation until the final version consistently conveyed the intended meaning. The dietary assessment scale comprises 3 factors: compliance (14 items), preventive behaviors (10 items), and information effectiveness (5 items), totaling 29 items. Each item is rated on a Likert scale from “Not at all” (1 point) to “Always” (5 points), with higher scores indicating greater dietary compliance. In the original scale development study,³³ Cronbach’s α value was 0.92 for compliance efficacy, preventive behaviors, and information effectiveness, respectively. In this study, these values were 0.80, 0.83, and 0.81, respectively.

Self-Care Activity

Self-care activity was assessed using the 22-item Measurement Tool for Self-care Activity in Gastric Cancer Surgery Patients.³⁴ This tool includes 7 domains: controlled dietary intake (4 items), avoidance of risks (3 items), rest and defecation (4 items), social support and stress management (3 items), adherence to meal frequency and method (4 items), portion control (2 items), and information seeking and future management (2 items). Each item is rated on a Likert scale ranging from “Cannot do at all” (1 point) to “Always do well” (4 points), with higher scores indicating higher levels of self-care activity. In the original scale development study,³⁴ Cronbach’s α value was 0.86, which is consistent with that of our study (0.83).

Unmet Nursing Needs

Nursing needs were assessed using the Learning Needs Assessment Scale for patients with cancer.³⁵ This scale was adapted based on the dietary education materials developed in this study. The Learning Needs Assessment Scale consisted of 13 items, each addressing aspects related to diet. Each item was rated on a 4-point Likert scale: “Very necessary” (4 points), “Generally necessary” (3 points), “Generally unnecessary” (2 points), and “Not necessary at all” (1 point), with higher scores indicating greater nursing needs. The unmet needs scores were calculated by subtracting the pre-intervention score from the post-intervention score. This difference reflects unmet nursing needs, with a higher difference score indicating greater needs. The Cronbach’s α value was 0.87 in our study.

Data Collection and Procedure of the Quasi-Experimental Study

To minimize the risk of cross-contamination between the 2 groups, the control group was enrolled earlier than the experimental group for a baseline survey, discharge education, and postintervention survey, spanning from November 2021 to April 2022. The control group completed their postintervention survey during their outpatient visit 1 month after discharge. All questionnaires were completed in a self-administered format after the researcher provided instructions. Each session took approximately 20 min to complete the questionnaire.

Once the baseline survey, routine discharge education, and postintervention survey of the control group were completed, the experimental group was recruited, and the procedure described above was conducted from May 2022 to February 2023. Before the first meal after gastrectomy, the baseline survey for the experimental group was conducted, followed by 20 min of dietary education. The average length of hospital stay was 1 week. Dietary and discharge education sessions were held in a quiet interview room to prevent the spread of information and protect privacy. One week after the discharge, a follow-up telephone consultation was conducted for 10 min. The postintervention survey took place during the outpatient visit 1 month after discharge. Following the completion of interventions and surveys for both groups, the trial was concluded successfully.

Waitlist Control Group

After completing the intervention procedures for the experimental and control groups, the control group received the same dietary education pamphlet that was provided to the experimental group. Additionally, a 20-minute postoperative dietary education session was made available to the control group upon request, with all participants, except 1 who passed away during treatment, opting to receive the education.

Data Analyses

The general characteristics of the study participants are expressed using means and standard deviations. To assess homogeneity between the experimental and control groups, independent t-test and χ^2 -test were employed. General characteristics served as confounding variables, while the diet intervention program served as the predictor. The outcomes included measures of fatigue, self-efficacy in nutrition and side-effect management, and self-care activity. Analysis of the intervention effect was conducted using intention-to-treat analysis. Changes in fatigue, self-efficacy for managing gastrointestinal side effects and nutrition, and self-care activity from the baseline to postintervention scores were compared between the 2 groups using independent t-tests. Unmet nursing needs scores after the intervention were also compared between the groups using an independent t-test. $P < .05$ was considered statistically significant. All statistical data were analyzed using SPSS software, version 25.0 (IBM, SPSS Inc).

Ethical Considerations

This study was conducted after receiving approval from the Institutional Review Board of Kyungpook National University (approval no. KNU 2021-0089; approval date, June 2, 2021), which reviewed and approved the purpose, methods, protection of the rights of participants, and survey instruments of the study to ensure adherence to ethical standards and participant safety. Written informed consent was obtained from all participating patients. Data and consent forms were treated confidentially and used solely for research purposes. Questionnaire responses were anonymous, and personal information was coded to ensure security and prevent unauthorized access. Upon completing data collection for the control group, they received materials and dietary education identical to those of the experimental

group. All participants were informed of their right to withdraw from the study at any time without encountering any disadvantages.

RESULTS

Homogeneity Test

One participant in the control group died during the study follow-up. Consequently, the final participant count included 59 individuals: 30 and 29 in the experimental group and control groups, respectively (Fig. 1). At baseline, the general characteristics and measures of fatigue, self-efficacy in managing gastrointestinal side effects, self-efficacy for nutritional management, and self-care activity did not exhibit statistically significant differences between both groups (Table 3).

Effectiveness of the Dietary Intervention Program

Table 4 demonstrates the effectiveness of postoperative dietary interventions for patients with gastric cancer. In the experimental group, fatigue significantly decreased from 88.9 points before the intervention to 76.7 points after the intervention ($P < .001$). In contrast, the change in fatigue in the control group was not significant from preintervention to postintervention ($P = .94$). The difference in fatigue scores before and after the program was significantly greater in the experimental group than in the control group ($P = .01$, effect size=0.76).

Self-efficacy in managing gastrointestinal side effects significantly improved in the experimental group, increasing from 15.9 points before the intervention to 36.7 points after the intervention ($P < .001$). In contrast, no significant changes were observed in the control group from preintervention to postintervention ($P = .37$). The difference in self-efficacy score changes before and after the program was statistically significant between both groups ($P < .001$, effect size=2.62).

Self-efficacy for nutritional management significantly improved in the experimental group, rising from 85.2 points before the intervention to 96.8 points after the intervention ($P < .001$). Similarly, a significant improvement was observed in the control group from preintervention to postintervention ($P = .01$). However, the increase in self-efficacy scores before and after the intervention was significantly higher in the experimental group than in the control group ($P = .03$, effect size=0.6).

Self-care activity significantly improved in the experimental group, rising from 54.8 points before the intervention to 63.3 points after the intervention ($P < .001$). A significant improvement was observed in the control group from preintervention to postintervention ($P = .007$). However, the increase in self-care activity scores before and after the intervention was significantly higher in the experimental group than in the control group ($P < .001$, effect size=0.83).

Lastly, after the intervention, the experimental group had significantly fewer nursing needs than the control group ($P < .001$, effect size=3.05).

DISCUSSION

This study developed a postoperative dietary intervention program for patients who underwent gastrectomy owing to gastric cancer. And the postoperative dietary intervention program was effective in improvements in fatigue, self-efficacy in managing gastrointestinal side effects, self-efficacy for nutritional management, self-care activity, and unmet nursing needs.

The improvement of fatigue scores from preintervention to postintervention was more pronounced in the experimental group than in the control group. While direct comparisons are challenging owing

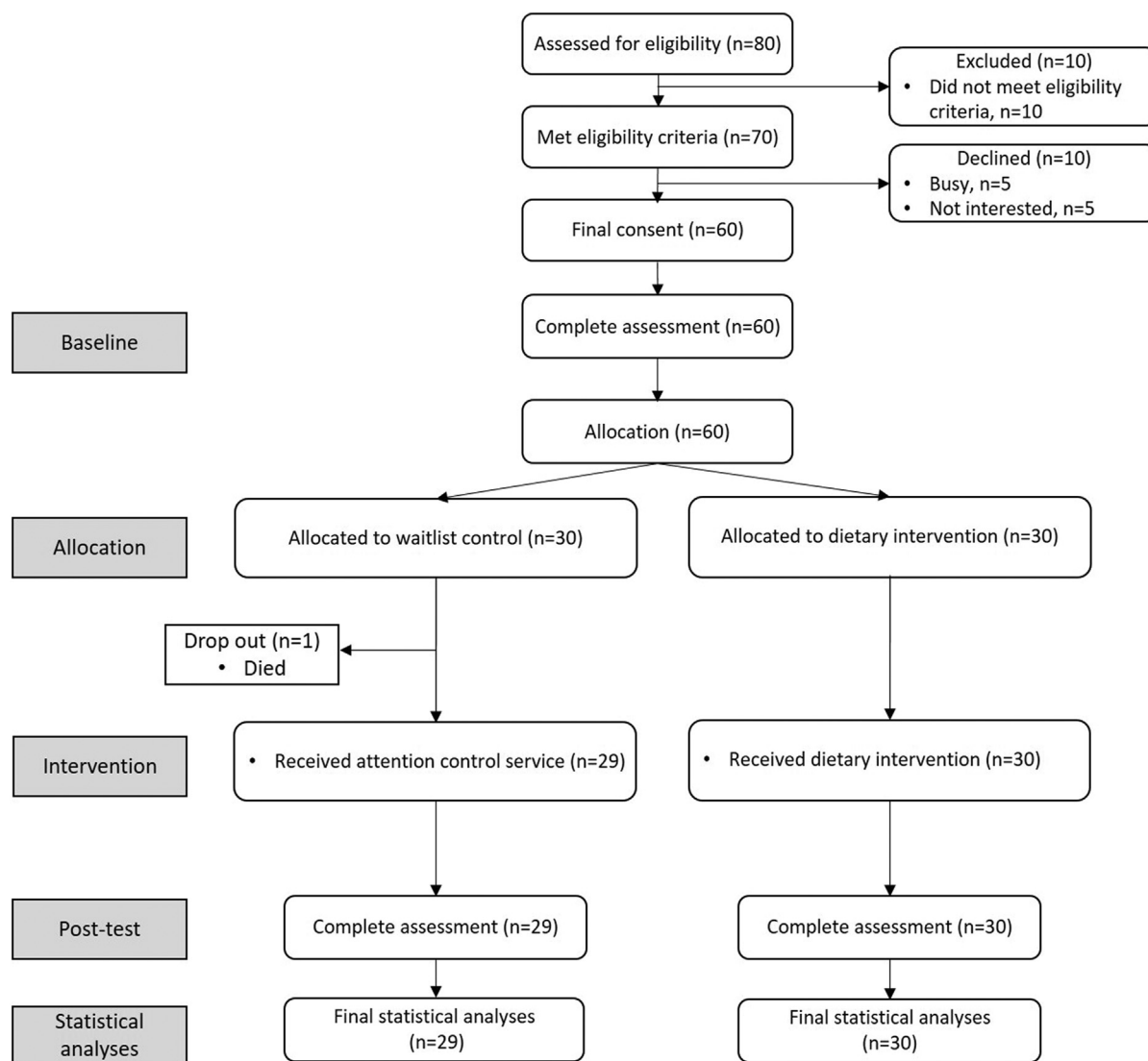


FIG. 1. Consolidated Standards of Reporting Trials (CONSORT) patient flow diagram.

to the lack of prior studies, specifically on the effects of dietary intervention programs on fatigue in patients with gastric cancer, our findings align with those of previous experimental studies on lifestyle interventions, including diet and exercise, for patients with cancer.^{36–38} The observed reduction in fatigue in our study may be related to improved dietary habits and nutritional status among patients with gastric cancer who underwent gastrectomy.

The experimental group demonstrated a more significant improvement in self-efficacy for managing gastrointestinal side effects and nutrition from preintervention to postintervention than the control group. This finding is supported by findings from previous experimental studies, emphasizing the role of adopting a healthy diet and regular exercise in enhancing self-efficacy among patients with breast cancer.³⁷ The current intervention further underscored that participants achieved self-efficacy by setting realistic goals. Self-efficacy plays a crucial role in influencing self-care activities, where confidence in a specific area correlates positively with actual self-care behaviors.³⁰ Consistent attention, nutritional counseling, and dietary education also positively influence how patients perceive the importance of their daily meals, promoting positive changes in dietary habits³⁹ among patients with cancer. Our study findings indicate that the dietary educational intervention was more effective in improving self-efficacy for nutritional management than general discharge

education alone. Furthermore, the enhancement in self-care activity was not solely attributed to the effectiveness of the diet intervention but was also mediated by improvements in self-efficacy.

Nurses should encourage self-care activities by offering tailored nursing interventions that help patients maintain their health and functionality. Our dietary intervention program is rooted in Orem's self-care theory,^{24,29} aiming to address the self-care deficits of patients, thereby promoting self-care activity and overall well-being.

In this study, self-care activity increased in both groups postintervention compared with that at preintervention. However, the improvement in self-care activity was significantly greater in the experimental group than in the control group. The control group received routine discharge education, while the experimental group received both dietary education intervention and discharge education. Routine discharge education includes wound care, symptom management for diarrhea and dumping syndrome, and guidance on when to visit a cancer clinic (e.g., for gastrointestinal bleeding, peritoneal infection, intestinal obstruction, drain tube obstruction or leakage, and suspected infection symptoms). This routine education may contribute to increased self-care activity. However, the experimental group received dietary education intervention and standard discharge education. Consequently, this group showed a more significant improvement in self-care activity than the control group. These

Table 3
Homogeneity Test of the Participants

| Characteristics | Experimental (n = 30) | | Control (n = 29) | | <i>t</i> or χ^2 | <i>P</i> |
|---|-----------------------|-------------|------------------|-------------|----------------------|----------|
| | n (%) | Mean (SD) | n (%) | Mean (SD) | | |
| Age (y) | | 71.3 (9.2) | | 68.1 (10.4) | 1.25 | .22 |
| Sex | | | | | 0.17 | .68 |
| Men | 26 (86.7) | | 24 (82.8) | | | |
| Women | 4 (13.3) | | 5 (17.2) | | | |
| Caregiver | | | | | 0.17 | .68 |
| No | 4 (13.3) | | 5 (17.2) | | | |
| Yes | 26 (86.7) | | 24 (82.8) | | | |
| Religion | | | | | 0.82 | .37 |
| No | 10 (33.3) | | 13 (44.8) | | | |
| Yes | 20 (66.7) | | 16 (55.2) | | | |
| Education | | | | | 1.35 | .25 |
| ≤ High school | 25 (83.3) | | 27 (93.1) | | | |
| ≥ College | 5 (16.7) | | 2 (6.9) | | | |
| Job | | | | | 2.85 | .09 |
| No | 10 (33.3) | | 16 (55.2) | | | |
| Yes | 20 (66.7) | | 13 (44.8) | | | |
| Monthly income (US\$) | | | | | 6.00 | .05 |
| <770 | 5 (16.7) | | 12 (41.4) | | | |
| ≥770, ≤1540 | 16 (53.3) | | 14 (48.3) | | | |
| >1540 | 9 (30.0) | | 3 (10.3) | | | |
| Comorbidity | | | | | 1.57 | .21 |
| No | 6 (20.0) | | 10 (34.5) | | | |
| Yes | 24 (80.0) | | 19 (65.5) | | | |
| Time since diagnosis (day) | | 32.1 (20.6) | | 27.6 (13.4) | 1.01 | .32 |
| Time since the end of operation (day) | | 14.2 (10.2) | | 15.0 (8.9) | -0.31 | .76 |
| Stage | | | | | 2.59 | .11 |
| I, II | 18 (60.0) | | 23 (79.3) | | | |
| III, IV | 12 (40.0) | | 6 (20.7) | | | |
| Operation type | | | | | 2.43 | .12 |
| Subtotal gastrectomy | 17 (56.7) | | 22 (75.9) | | | |
| Total gastrectomy | 13 (43.3) | | 7 (24.1) | | | |
| Family living together | | | | | 3.37 | .07 |
| No | 5 (16.7) | | 11 (37.9) | | | |
| Yes | 25 (83.3) | | 18 (62.1) | | | |
| Residence area | | | | | 4.71 | .10 |
| Metropolitan | 14 (46.7) | | 20 (69.0) | | | |
| City, small city | 16 (53.3) | | 8 (27.6) | | | |
| Countryside | 0 (0.0) | | 1 (3.4) | | | |
| National insurance | | | | | 0.17 | .68 |
| Health insurance | 26 (86.7) | | 24 (82.8) | | | |
| Medical aid | 4 (13.3) | | 5 (17.2) | | | |
| Private insurance | | | | | 3.37 | .07 |
| No | 16 (53.3) | | 11 (37.9) | | | |
| Yes | 14 (46.7) | | 18 (62.1) | | | |
| Fatigue | | 88.9 (9.9) | | 84.1 (16.0) | -1.37 | .18 |
| Self-efficacy in managing gastrointestinal side effects | | 15.9 (4.6) | | 17.0 (5.7) | .82 | .42 |
| Self-efficacy for nutritional management | | 85.2 (7.3) | | 81.7 (9.9) | -1.58 | .12 |
| Self-care activity | | 54.8 (6.9) | | 56.1 (7.7) | 0.69 | .50 |

SD, standard deviation.

findings suggest the dietary intervention program is more effective in improving self-care activity than the standard discharge education.

Moreover, unmet nursing needs were lower in the experimental group compared to the control group, which received only routine discharge education, which received only routine discharge education. This finding aligns with findings that support the implementation of structured and need-based education, which has a significant influence on satisfying the needs and improving the satisfaction of patients.⁴⁰ When systematic and theory- and need-based education is delivered using appropriate materials tailored to the target participants, their needs are effectively met. The educational material in this study was developed using the ADDIE model, contributing to a higher level of satisfaction with needs in the experimental group than in the control group.

This study has some limitations. First, it was conducted exclusively at a single general hospital, and the dietary intervention program was specifically targeted at patients with gastric cancer who underwent gastrectomy. Therefore, generalizing the results

to a broader population of patients with cancer who underwent gastrointestinal surgery may pose challenges. Therefore, future research should involve multiple hospitals and include patients with various types of gastrointestinal cancer to replicate and validate the findings in this study. Second, the intervention consisted of a 1-time, relatively brief (20-minute) dietary program for inpatients. While the timing, frequency, and duration were appropriate for a general surgical unit, future studies may need to tailor these factors for different clinical settings. Moreover, this study did not assess the long-term effects of nutritional interventions, highlighting the need for further research to evaluate these outcomes over extended periods.

Conversely, the strength of this study lies in the development of dietary educational materials specifically tailored to the nursing needs of patients who underwent gastrectomy for gastric cancer. Subsequently, a dietary intervention program was then created and applied through individualized patient education in the inpatient setting. Furthermore, the dietary intervention

Table 4
Effectiveness of Postoperative Dietary Interventions in Patients with Gastric Cancer

| Outcome | Preintervention Mean (SD) | Postintervention | t | P ^a | Difference Mean (SD) | t | Effect size (Hedges' g) | P ^b |
|---|---------------------------|------------------|--------|----------------|----------------------|--------|-------------------------|----------------|
| Fatigue | | | | | | 2.91 | 0.76 | 0.01 |
| Experimental | 88.9 (9.9) | 76.7 (10.8) | 4.69 | <.001 | −12.2 (14.2) | | | |
| Control | 84.1 (16.0) | 83.9 (9.0) | 0.08 | .94 | −0.2 (17.2) | | | |
| Self-efficacy in managing gastrointestinal side effects | | | | | | −10.11 | 2.62 | <0.001 |
| Experimental | 15.9 (4.6) | 36.7 (8.9) | −11.45 | <.001 | 20.8 (10.0) | | | |
| Control | 17.0 (5.7) | 15.9 (4.4) | 0.91 | .37 | −1.1 (6.3) | | | |
| Self-efficacy for nutritional management | | | | | | −2.30 | 0.60 | 0.03 |
| Experimental | 85.2 (7.3) | 96.8 (12.8) | −4.58 | <.001 | 11.6 (13.9) | | | |
| Control | 81.7 (9.9) | 86.2 (9.3) | −2.65 | .01 | 4.5 (9.2) | | | |
| Self-care activity | | | | | | −3.13 | 0.83 | <0.001 |
| Experimental | 54.8 (6.9) | 63.3 (5.3) | −6.45 | <.001 | 8.5 (7.2) | | | |
| Control | 56.1 (7.7) | 59.3 (6.1) | −2.93 | .007 | 3.1 (5.8) | | | |
| Unmet nursing needs | | | | | | 12.46 | 3.05 | <0.001 |
| Experimental | NA | NA | | | 4.7 (6.6) | | | |
| Control | NA | NA | | | 24.3 (5.5) | | | |

^a P value obtained by paired t-test.
^b P value indicating the difference in score changes from postintervention to preintervention between the 2 groups.

program developed in this study will serve as a crucial foundation for future advanced nutritional interventions spearheaded by the Nutrition Support Team (NST), comprising physicians, pharmacists, dietitians, and nurses.

CONCLUSION

The postoperative dietary intervention program for patients with gastric cancer who underwent gastrectomy successfully reduced fatigue, improved self-efficacy in managing gastrointestinal side effects, enhanced self-efficacy for nutritional management, and increased self-care activity. Moreover, structured, individualized education programs are crucial in addressing the unmet nursing needs of patients. Consequently, this study underscores the significance of dietary intervention and offers foundational data to support effective nursing practices to enhance recovery and manage postoperative diet-related side effects and nutritional challenges.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

CRediT authorship contribution statement

Dahye KIM: Conceptualization, Data curation, Formal analysis, Methodology, Writing – original draft, Writing – review & editing.
Myung Kyung LEE: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Project administration, Methodology, Investigation, Funding acquisition, Conceptualization.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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ETHICS APPROVAL STATEMENT

This study was conducted after receiving approval from the Institutional Review Board of Kyungpook National University (approval no. KNU 2021-0089; approval date, June 2, 2021), which reviewed and approved the purpose, methods, protection of the rights of participants, and survey instruments of the study to ensure adherence to ethical standards and participant safety. Written informed consent was obtained from all participating patients

Supplementary materials

Supplementary material associated with this article can be found in the online version at [doi:10.1016/j.soncn.2024.151797](https://doi.org/10.1016/j.soncn.2024.151797).

REFERENCES

- Ilic M, Ilic I. Epidemiology of stomach cancer. *World J Gastroenterol.* 2022;28 (12):1187–1203. <https://doi.org/10.3748/wjg.v28.i12.1187>.
- Pituskin E. Cancer as a new chronic disease: Oncology nursing in the 21st Century. *Can Oncol Nurs J.* 2022;32(1):87–92. Published 2022 Feb 1.
- Lv G, Zhao D, Li G, Qi M, Dong X, Li P. When experiencing a surgery: Gastrointestinal cancer patients' longitudinal trajectories in psychological stress and their association with quality of recovery. *Asia Pac J Oncol Nurs.* 2022;9(6):100064. <https://doi.org/10.1016/j.apjon.2022.04.003>. Published 2022 Apr 11.
- Schütte K, Schulz C, Middelberg-Bisping K. Impact of gastric cancer treatment on quality of life of patients. *Best Pract Res Clin Gastroenterol.* 2021;50-51:101727. <https://doi.org/10.1016/j.bpg.2021.101727>.
- Lee HJ, Kim JT, Lee BK. Effects of a nutrition support team with parenteral nutrition on gastrointestinal cancer patients who underwent surgery. *Journal of Clinical Nutrition.* 2014;6(2):79–86.
- Jeong HS, Teong CH, Choi YJ, Kim WJ, Lee AR. Attitudes of medical staff and factors related to nutritional support for patient care in a university hospital. *J Clin Nutr.* 2014;6(1):37–41.
- Kroneman M, Siegers JJ. The effect of hospital bed reduction on the use of beds: a comparative study of 10 European countries. *Soc Sci Med.* 2004;59(8):1731–1740. <https://doi.org/10.1016/j.socscimed.2004.01.036>.
- Hajalizadeh A, Ahmadinejad M, Dehghan M, Arab M. The educational needs of family of patients discharged from the intensive care units: the viewpoints of nurses and the patients' families. *Crit Care Res Pract.* 2021;2021:9956023. <https://doi.org/10.1155/2021/9956023>. Published 2021 Apr 30.
- Kim H, Suh EE, Lee HJ, Yang HK. The effects of patient participation-based dietary intervention on nutritional and functional status for patients with gastrectomy: a randomized controlled trial. *Cancer Nurs.* 2014;37(2):E10–E20. <https://doi.org/10.1097/NCC.0b013e31829193c8>.
- Lordick F, Allum W, Carneiro F, et al. Unmet needs and challenges in gastric cancer: the way forward. *Cancer Treat Rev.* 2014;40(6):692–700. <https://doi.org/10.1016/j.ctrv.2014.03.002>.
- Kim I, Lim JY, Kim JK, et al. Effectiveness of a personalized digital exercise and nutrition-based rehab program for patients with gastric cancer after surgery: Study protocol for a randomized controlled trial. *Digit Health.* 2023;9:20552076231187602. <https://doi.org/10.1177/20552076231187602>. Published 2023 Jul 17.

12. Cuthbert CA, Farragher JF, Hemmelgarn BR, Ding Q, McKinnon GP, Cheung WY. Self-management interventions for cancer survivors: A systematic review and evaluation of intervention content and theories. *Psychooncology*. 2019;28(11):2119–2140. <https://doi.org/10.1002/pon.5215>.
13. Rothman AJ, Salovey P. Shaping perceptions to motivate healthy behavior: the role of message framing. *Psychol Bull*. 1997;121(1):3–19. <https://doi.org/10.1037/0033-2909.121.1.3>.
14. Block LG, Keller PA. When to accentuate the negative: The effects of perceived efficacy and message framing on intentions to perform a health-related behavior. *Journal of Marketing Research*. 1995;32(2):192–203. <https://doi.org/10.1177/002224379503200206>.
15. O'Keefe DJ, Jensen JD. The relative persuasiveness of gain-framed and loss-framed messages for encouraging disease prevention behaviors: a meta-analytic review. *J Health Commun*. 2007;12(7):623–644. <https://doi.org/10.1080/10810730701615198>.
16. Weber D, O'Brien K. Cancer and Cancer-Related Fatigue and the Interrelationships With Depression, Stress, and Inflammation. *J Evid Based Complementary Altern Med*. 2017;22(3):502–512. <https://doi.org/10.1177/2156587216676122>.
17. Lee MK, Yun YH. Working situation of cancer survivors versus the general population. *J Cancer Surviv*. 2015;9(2):349–360. <https://doi.org/10.1007/s11764-014-0418-7>.
18. Park KB, Lee SS, Kwon OK, Chung HY, Yu W. Chronological Changes in Quality of Life after Distal Gastrectomy for Gastric Cancer. *J Gastric Cancer*. 2017;17(2):110–119. <https://doi.org/10.5230/jgc.2017.17.e14>.
19. Kim KH, Han YI, Sohn SK. Relationship between fatigue and nutritional status in patients with gastric cancer. *Asian Oncology Nursing*. 2005;5(2):87–96.
20. Pender NJ, Murdaugh CL, Parsons MA. *Health promotion in nursing practice*. Michigan, United State: University of Michigan; 2006. Available from: https://deepblue.lib.umich.edu/bitstream/handle/2027.42/85350/HEALTH_PROMOTION_MA-NUAL_Rev_5-2011.pdf.
21. ElGerges NS. Effects of therapeutic education on self-efficacy, self-care activities and glycemic control of type 2 diabetic patients in a primary healthcare center in Lebanon. *J Diabetes Metab Disord*. 2020;19(2):813–821. <https://doi.org/10.1007/s40200-020-00567-4>. Published 2020 Jun 12.
22. Correia JC, Waqas A, Assal JP, et al. Effectiveness of therapeutic patient education interventions for chronic diseases: A systematic review and meta-analyses of randomized controlled trials. *Front Med (Lausanne)*. 2023;9:996528. <https://doi.org/10.3389/fmed.2022.996528>. Published 2023 Jan 25.
23. Ravasco P, Monteiro-Grillo I, Vidal PM, Camilo ME. Dietary counseling improves patient outcomes: a prospective, randomized, controlled trial in colorectal cancer patients undergoing radiotherapy. *J Clin Oncol*. 2005;23(7):1431–1438. <https://doi.org/10.1200/JCO.2005.02.054>.
24. Hartweg DL, Metcalfe SA. Orem's Self-Care Deficit Nursing Theory: Relevance and Need for Refinement. *Nurs Sci Q*. 2022;35(1):70–76. <https://doi.org/10.1177/08943184211051369>.
25. Dev R, Agosta M, Fellman B, et al. Coping strategies and associated symptom burden among patients with advanced cancer. *Oncologist*. 2024;29(2):166–175. <https://doi.org/10.1093/oncolo/oyad253>.
26. Nosbusch JM, Weiss ME, Bobay KL. An integrated review of the literature on challenges confronting the acute care staff nurse in discharge planning. *J Clin Nurs*. 2011;20(5-6):754–774. <https://doi.org/10.1111/j.1365-2702.2010.03257.x>.
27. Klassen D, Strauch C, Alteheld B, et al. Assessing the effects of a perioperative nutritional support and counseling in gastrointestinal cancer patients: a retrospective comparative study with historical controls. *Biomedicine*. 2023;11(2):609. <https://doi.org/10.3390/biomedicine11020609>. Published 2023 Feb 17.
28. Miao ZF, Chen H, Wang ZN, et al. Progress and remaining challenges in comprehensive gastric cancer treatment. *Holistic Integrative Oncol*. 2022;1(1):4.
29. Wagnild G, Rodriguez W, Pritchett G. Orem's self-care theory: a tool for education and practice. *J Nurs Educ*. 1987;26(8):342–343. <https://doi.org/10.3928/0148-4834-19871001-12>.
30. Bandura A. Self-efficacy mechanism in human agency. *Am Psychol*. 1982;37(2):122–147. <https://doi.org/10.1037/0003-066X.37.2.122>.
31. Garg N, Govind R, Nagpal A. Message framing effects on food consumption: A social marketing perspective. *Aus J Manage*. 2021;46(4):690–716. <https://doi.org/10.1177/0312896221989398>.
32. Kim K-H, Sohn S-K. Development of fatigue scale for cancer patients. *J Wholistic Nurs Sci*. 2011;5:27–43. Retrieved from: <https://scholar.kyobobook.co.kr/article/detail/4050026619809>.
33. Shamsaliniya A, Ghadimi R, Chafjiri RT, Norouzzinejad F, Pourhabib A, Ghaffari F. Nutrition self-efficacy assessment: designing and psychometric evaluation in a community-dwelling elderly population. *J Health Popul Nutr*. 2019;38(1):38. <https://doi.org/10.1186/s41043-019-0203-3>. Published 2019 Dec 3.
34. Jeon MK, Park GJ. Development of a self-care performance scale for patients with stomach cancer after gastrectomy. *Asian Oncol Nurs*. 2016;16(2):67–74. <https://doi.org/10.5388/aon.2016.16.2.67>.
35. Lauer P, Murphy SP, Powers MJ. Learning needs of cancer patients: a comparison of nurse and patient perceptions. *Nurs Res*. 1982;31(1):11–16.
36. An H, Nho JH, Yoo S, Kim H, Nho M, Yoo H. *J Korean Acad Nurs*. 2015;45(6):812–822. <https://doi.org/10.4040/jkan.2015.45.6.812>.
37. Lee MK, Yun YH, Park HA, Lee ES, Jung KH, Noh DY. A Web-based self-management exercise and diet intervention for breast cancer survivors: pilot randomized controlled trial. *Int J Nurs Stud*. 2014;51(12):1557–1567. <https://doi.org/10.1016/j.ijnurstu.2014.04.012>.
38. Yun YH, Kim YA, Lee MK, et al. A randomized controlled trial of physical activity, dietary habit, and distress management with the Leadership and Coaching for Health (LEACH) program for disease-free cancer survivors. *BMC Cancer*. 2017;17(1):298. <https://doi.org/10.1186/s12885-017-3290-9>. Published 2017 May 2.
39. Vasiloglou MF, Fletcher J, Poulika KA. Challenges and perspectives in nutritional counselling and nursing: a narrative review. *J Clin Med*. 2019;8(9):1489. <https://doi.org/10.3390/jcm8091489>. Published 2019 Sep 18.
40. Bafandeh Zende M, Hemmati Maslarpak M, Jasemi M. Nurses' perceptions of their supportive role for cancer patients: a qualitative study. *Nurs Open*. 2022;9(1):646–654. <https://doi.org/10.1002/nop2.1112>.