

Effects of a food preparation program on dietary well-being for stroke patients with dysphagia

A pilot study

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Abstract

Background: Dysphagia is one of the common issues observed in patients with stroke. Stroke patients with dysphagia have to eat blended food or similar types of food for each meal, resulting in dietary dissatisfaction. The purpose of this study was to investigate the effects of a food preparation program on dietary well-being for stroke patients with dysphagia.

Methods: This study was a pilot randomized clinical trial. Twenty-two patients were assigned randomly into the food preparation group (n = 11) and control group (n = 11). The food preparation group received oral motor exercises, recognition of food texture and thickener, and hands-on food preparation for 6 weeks. Outcome measures included the Dietary Well-Being Scale, brief version of the World Health Organization Quality of life, Swallowing Quality of Life Questionnaire, and Mini Nutritional Assessment.

Results: Patients in the food preparation group showed significant improvements in the Dietary Well-Being Scale, psychological and environmental domains of the brief version of the World Health Organization Quality of life ($P = .001-.024$) with small to large effect sizes (success rate difference = 0.23–0.46). The Swallowing Quality of Life Questionnaire and Mini Nutritional Assessment displayed non-significant differences ($P = .053-.092$) and revealed small to moderate effect sizes (success rate difference = 0.23–0.32).

Conclusions: The food preparation program showed a positive impact on dietary well-being and a potential improvement in the health-related quality of life, quality of life related to the process of swallowing, and nutritional status for stroke patients with dysphagia. We recommend that stroke patients with dysphagia receive adequate knowledge and hands-on food preparation training to increase their dietary intake and well-being.

Abbreviations: DWB = Dietary Well-Being scale, MNA = Mini Nutritional Assessment, SRD = success rate difference, SWAL-QOL = Swallowing Quality of Life Questionnaire, WHOQOL-BREF = brief version of the World Health Organization Quality of Life.

Keywords: dietary well-being, dysphagia, stroke

1. Introduction

Dysphagia is one of the common problems seen in patients with stroke.^[1] About 28% to 67% of stroke patients have reported

swallowing difficulties.^[2] Patients with a history of stroke may aspirate food and water into the esophagus or into the trachea during swallowing, leading to pneumonia and coughing.^[3] Therefore, patients may refuse to eat and drink due to fear of coughing, which increases the risk of malnutrition and dehydration.^[4]

Stroke patients with dysphagia often require a nasogastric tube or a percutaneous endoscopic gastrostomy tube for feeding instead of dietary intake by mouth to maintain balanced nutrition (e.g., protein and minerals).^[5–7] Along with the treatment, they may receive chewing and swallowing training in order to remove the nasogastric tube, fulfill their eating desires, and increase their quality of life.^[8,9] To assist patients with the re-adapting of eating by mouth and to provide patients with proper nutritional balance, the caregiver may mix foods together.^[10] The pureed food which is prepared by the caregiver does not appear like the original food and tastes similar for each meal, which results in patients' dietary dissatisfaction and poor appetite.^[11] In addition, both patients with stroke and their caregivers may lack knowledge about food preparation (e.g., food texture and thickener) and would not be able to prepare food in real life.^[12] Modifying food texture can reduce efforts for chewing and swallowing. Modifying food texture is commonly carried out by chopping food into small pieces, tenderizing food, and blending food and liquid into a smooth texture.^[13] Food thickener enhances the viscosity of fluids and food to increase swallowing safety and reduce the risk of aspiration.^[14] Therefore, healthcare professionals should provide information on food preparation

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for stroke patients with dysphagia and their caregivers to improve dietary intake by mouth, receive adequate nutrition, and increase dietary well-being.

Dietary well-being includes four aspects: physical, psychological, emotional, and social well-being.^[1,15–17] Physical well-being refers to dietary intake that provides the individual with a feeling of positivity about his/her physical function and energy. In other words, a diet that allows an individual's body to obtain adequate rest and activity.^[15] Psychological well-being describes dietary intake that could give rise to positive psychological function, for example, a harmonious dining atmosphere with others.^[16] Emotional well-being includes two parts: cognition and emotion. Cognition refers to the satisfaction with respect to food-related life. Emotion refers to the positive emotion associated with dietary intake, such as affection, joy, contentment, and pride.^[11] Social well-being describes an individual's values based on dietary intake which affects his/her social and future life. The above-mentioned four aspects of dietary well-being are important as these aspects influence an individual's experience associated with eating and food choices.

About 58.3% of patients with stroke do not participate in food preparation and 77.0% of patients require full assistance with food preparation.^[18,19] Evidence on the effects of food preparation on dietary well-being in stroke patients with dysphagia is limited. Stroke patients with dysphagia should understand food characteristics and learn how to prepare food to improve their dietary well-being and quality of life. Therefore, the objective of this study was to investigate the effects of a food preparation program on dietary well-being and quality of life in stroke patients with dysphagia. The food preparation program in this study was designed by taking into account the four aspects of dietary well-being (i.e., physical, psychological, emotional, and social).

2. Methods

2.1. Participants

A single-blinded pilot randomized clinical trial consisting of an experimental and control group was conducted for outpatients with stroke who were in stable physical conditions. The study was carried out in Department of Neurology in Taiwan Adventist Hospital between April and July 2018. Taiwan Adventist Hospital is one of the teaching hospitals operated by the Seventh-Day Adventist Church across the world. All participants who met the following criteria were included in the study:

1. diagnosed with ischemic or hemorrhagic stroke;
2. Eating Assessment Tool-10 (EAT-10) score ≥ 3 ;
3. age over 20 years old; and
4. ability to follow verbal instructions to complete the procedure.

Patients with the following conditions were excluded:

1. major comorbidities (e.g., brain tumor, neurodegenerative disease, Parkinsonism);
2. neck injury and surgery-induced difficulty in swallowing; and
3. unstable medical condition that may result in re-hospitalization during the study period.

This study was approved by the Human Research Committee. Written informed consent was obtained from all participants. This study was registered in ClinicalTrials.gov (NCT04347863).

2.2. Procedure

Eligible participants were randomly assigned into two groups (experimental group and control group) using a random number table created from MS Excel by the third author who did not administer the assessments. One certified dietitian carried out the food preparation program. The experimental group received the food preparation program once a week, one hour each time for six consecutive weeks. The control group did not receive any nutrition related interventions. Before and after the 6-week program, the Dietary Well-Being scale (DWB), brief version of the World Health Organization Quality of Life (WHOQOL-BREF), Swallowing Quality of Life Questionnaire (SWAL-QOL), and Mini Nutritional Assessment (MNA) were conducted on all participants in a random order by the other certified dietitian who was blinded about the participants' allocations. The flowchart demonstrating the participants' enrollment is shown in Figure 1.

2.3. Intervention

The food preparation program in this study included six categories of food (i.e., grains, vegetables, proteins, dairy, fruits, and fats). This was a 6-week program conducted on a group of 3 to 4 patients with stroke. Each week the program was carried out in a stepwise approach including three parts:

1. conducting oral motor exercises of lip, jaw, and tongue;
2. recognizing food texture and thickener; and
3. hands-on food preparation.

In addition to that, specific topics were introduced each week. In the first week, education regarding how to choose healthy food, how to maintain a balanced diet, and how to prepare ingredients were carried out. In the second week, the natural thickeners used for preparing food, including lotus root starch, soy flour, milk powder, rice powder, almond powder, black sesame powder, and hazelnut powder were taught to the group. In the third week, energy-boosting foods were introduced. In the fourth week, the technique of reshaping food was practiced. In the fifth week, recipes consisting of soft food which helped with easy chewing and biting were introduced. In the sixth week, a balanced, nutritious, and texture-modified diet was prepared. The caregivers also participated in the 6-week food preparation program.

2.4. Outcome measures

The EAT-10 is a screening tool used for the self-detection of dysphagia. It has 10 questions and uses the 5-point scale (0–1–2–3–4). The total score ranges from 0 to 40. A higher score displays severer swallowing problems. An EAT-10 score of ≥ 3 represents a swallowing disorder.^[20] The EAT-10 has been examined for reliability and validity in patients with a history of stroke.^[20,21]

The DWB is a dietary well-being questionnaire. This questionnaire has 21 questions and is divided into four categories of well-being: physical (5 items), psychological (6 items), emotional (5 items), and social (5 items). The DWB is a 6-point scale, graded from 1 (strongly disagree) to 6 (strongly agree). The range of scores of the physical, psychological, emotional, and social categories are 5–30, 6–36, 5–30, and 5–30, respectively. A higher score in each category reveals that the participant has better specific dietary well-being.^[22]

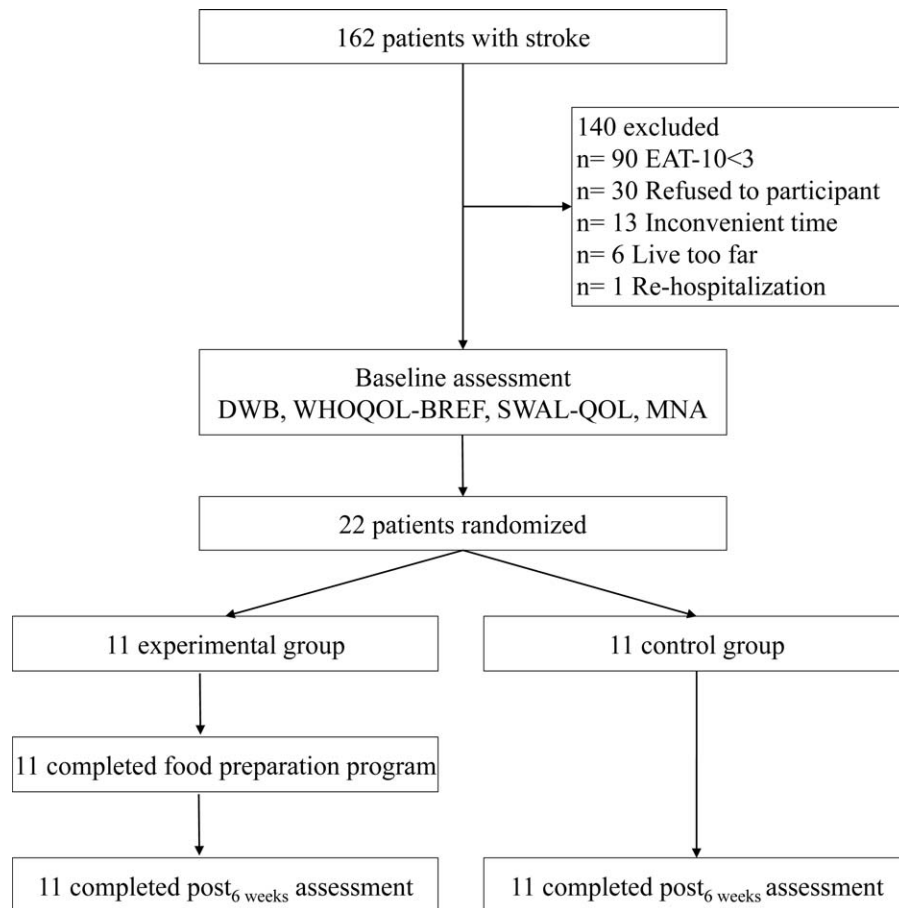


Figure 1. Flowchart of participants' enrollment.

The WHOQOL-BREF is a health-related quality of life scale, including four domains: physical health, psychological, social, and environmental. It contains 26 items and is used as a 5-point scale (1–2–3–4–5). The score of each domain ranges from 0 to 100. A higher score displays better quality of life. The psychometric properties of the WHOQOL-BREF have been verified.^[23,24]

The SWAL-QOL assesses the quality of life linked with the process of swallowing. It consists of 11 domains and 44 questions. These domains are physical symptoms, fatigue, food selection, eating habits, fear, mental health, psychological burden, social function, communication, actual diet, and general health. One item in the actual diet domain (i.e., using tube to eat or drink) uses a 2-point scale (1 and 5) while the other 43 items are evaluated on a 5-point scale (1–2–3–4–5). The total score ranges from 44 to 220 points. The higher the score, the better the quality of life with respect to swallowing. The Chinese version of the SWAL-QOL has been examined for reliability and validity.^[25]

The MNA assesses nutritional status. It includes 18 items. The range of total score extends from 0 to 30. A greater score demonstrates better nutritional status. The cut off scores of the MNA value are as follows: ≥ 24 demonstrates well-nourished, 17 to 23.5 demonstrates a risk of malnutrition, and < 17 demonstrates malnourished.^[26] The MNA has been shown to have good test–retest reliability in patients with stroke.^[27]

2.5. Data analysis

We conducted non-parametric statistics in this study due to the small sample size. The Mann–Whitney U test and Chi-square test were applied to analyze the demographic characteristics and baseline outcome measures (continuous and categorical variables, respectively) between the experimental and control groups. The change in scores between pre and post assessments were calculated. The Mann–Whitney U test was adopted to investigate the differences in change of scores associated with the four categories of the DWB, the four domains of the WHOQOL-BREF, SWAL-QOL, and MNA between both groups (two-tailed, $\alpha = 0.05$). We estimated the effect size for nonparametric statistics (i.e., success rate difference [SRD]). The standards of the effect size were: > 0.43 for large, 0.28 to 0.43 for moderate, and 0.11 to 0.27 for small.^[28] Because no studies have been conducted on food preparation in patients with stroke, we calculated the sample size by following the rule of thumb (~ 12 per group) in this study.^[29]

3. Results

Between April and July 2018, 162 patients with stroke were screened for inclusion in the study. Among these, 140 were excluded due to various reasons such as EAT-10 score < 3 , refused to participate, expressed timing was inconvenient, lived too far, or underwent re-hospitalization. Twenty-two patients

Table 1**Descriptive characteristics of the patients with stroke.**

Characteristic	Food preparation group (n=11)	Control group (n=11)	P
Age (years), mean (SD)	78.09 (9.82)	78.18 (6.97)	.895
Gender, n (%)			1.000
Male	7 (63.64)	7 (63.64)	
Female	4 (36.36)	4 (36.36)	
Stroke type, n (%)			.306
Ischemic	10 (90.90)	11 (100.00)	
Hemorrhagic	1 (9.09)	0 (0.00)	
Side of hemiplegia, n (%)			.201
Left	4 (36.36)	7 (63.64)	
Right	7 (63.64)	4 (36.36)	
Time of onset (year), mean (SD)	4.09 (2.66)	6.27 (6.71)	.764
Education, n (%)			.214
≤Elementary school	2 (18.18)	2 (18.18)	
Junior high school	0 (0.00)	1 (9.09)	
High-school or higher	9 (81.82)	8 (72.73)	
EAT-10, mean (SD)	6.64 (5.10)	6.27 (5.71)	.422

EAT-10 = Eating Assessment Tool-10, SD = standard deviation.

were randomly assigned to the experimental group (n=11) or control group (n=11). We stopped the recruitment because none of the outpatients satisfied the eligibility criteria for 2 months. There were no significant differences between the two groups in relation to age, gender, stroke type, side of hemiplegia, time of onset, education, and EAT-10 ($P = .201-1.000$) scores (Table 1). The mean age was about 78 years for both groups. The mean score of the EAT-10 for both groups ranged between 6.27 and 6.64.

While conducting baseline comparison, no statistically significant differences were found between the groups in the four categories of the DWB, four domains of the WHOQOL-BREF, SWAL-QOL, and MNA (Table 2). The change scores of the four

categories in the DWB between the two groups revealed statistically significant differences ($P = .001-0.024$). Except the physical category which showed small effect size (SRD = 0.23), all the other categories showed large effect sizes (SRD = 0.46). For the WHOQOL-BREF, the change scores of two domains (i.e., psychological and environmental) displayed statistically significant differences ($P = 0.005-0.006$) with small to moderate effect size (SRD = 0.27-0.40). The other two domains showed no significant differences ($P = .061-0.261$) with small effect size (SRD = 0.18-0.23). The change scores of the SWAL-QOL and MNA revealed non-significant differences ($P = .053-.092$) and showed small and moderate effect sizes (SRD = 0.23 and 0.32, respectively).

Table 2**Comparison of the food preparation group and control group.**

Outcome	Group	Baseline		Post ₆ weeks – baseline		SRD
		Mean (SD)	z Value (P)	Mean (SD)	z Value (P)	
DWB-physical	Food preparation	21.82 (3.19)	-0.924 (.355)	2.27 (3.44)	-2.260 (.024)	0.23
	Control	20.55 (3.88)	-	-1.91 (4.09)	-	-
DWB-psychological	Food preparation	26.91 (5.09)	-2.072 (.038)	3.00 (3.46)	-2.933 (.003)	0.46
	Control	20.82 (7.11)	-	-3.64 (4.95)	-	-
DWB-emotional	Food preparation	23.10 (3.70)	-1.754 (.079)	3.73 (4.03)	-3.424 (.001)	0.46
	Control	20.10 (4.64)	-	-3.55 (4.03)	-	-
DWB-social	Food preparation	21.73 (3.56)	-2.014 (.044)	1.45 (3.01)	-2.437 (.015)	0.46
	Control	18.28 (4.08)	-	-4.00 (5.67)	-	-
WHOQOL-BREF-physical	Food preparation	65.23 (10.38)	-0.796 (.426)	-2.73 (20.33)	-1.125 (.261)	0.18
	Control	59.18 (16.11)	-	-8.64 (9.50)	-	-
WHOQOL-BREF-psychological	Food preparation	58.09 (17.41)	-0.033 (.973)	7.36 (10.20)	-2.776 (.006)	0.40
	Control	57.64 (16.94)	-	-9.91 (14.18)	-	-
WHOQOL-BREF-social	Food preparation	63.18 (11.03)	-1.173 (.241)	-0.64 (12.49)	-1.876 (.061)	0.23
	Control	54.45 (15.15)	-	-9.64 (7.20)	-	-
WHOQOL-BREF-environment	Food preparation	63.27 (17.02)	-0.133 (.894)	10.73 (13.73)	-2.805 (.005)	0.27
	Control	66.10 (12.03)	-	-7.55 (13.34)	-	-
SWAL-QOL	Food preparation	176.00 (25.58)	-1.610 (.107)	1.45 (22.26)	-1.939 (.053)	0.23
	Control	159.64 (24.34)	-	-17.34 (14.56)	-	-
MNA	Food preparation	26.14 (2.62)	-1.883 (.060)	1.14 (1.19)	-1.684 (.092)	0.32
	Control	24.36 (3.20)	-	-0.32 (2.11)	-	-

DWB = Dietary Well-Being Scale, MNA = Mini Nutritional Assessment, SD = standard deviation, SRD = success rate difference, SWAL-QOL = Swallowing Quality of Life Questionnaire, WHOQOL-BREF = brief version of the World Health Organization Quality of Life.

4. Discussion

To the best of our knowledge, this is the first study to conduct a food preparation program considering the four aspects of dietary well-being (i.e., physical, psychological, emotional, and social) on stroke patients with dysphagia. The results of this study showed that there were significant differences in the four well-being categories (i.e., physical, psychological, emotional, and social) of the DWB between the food preparation group and control group. That is, stroke patients with dysphagia in the food preparation group showed improvements in the four aspects of dietary well-being. Three categories of the DWB (i.e., psychological, emotional, and social) displayed large effect sizes, indicating the food preparation program had large treatment effects in these categories. Dietary intake impacts psychological state, emotional aspects, happiness, and social support.^[30] Patients in the food preparation group can gain knowledge related to food preparation (e.g., texture and thickener) and consult their dietary needs with a dietitian, which can satisfy their psychological, emotional, and social well-being. Our findings were consistent with similar studies in healthy people.^[31,32] In this study, stroke patients with dysphagia in the control group showed lower scores in dietary well-being after 6 weeks. Therefore, our results demonstrate that providing a food preparation program is necessary to enhance dietary well-being for stroke patients with dysphagia.

The environmental domain of the WHOQOL-BREF revealed a significant difference and had small effect size between the two groups. The environmental domain contains items assessing opportunities to acquire new information and skills and participate in leisure activities.^[33] The food preparation program of this study provides chances for participants to obtain new information on food characteristics and cook food hands-on. Cooking activities have been identified as important for patients' self-perceived life satisfaction and as a meaningful intervention during rehabilitation in patients with stroke.^[19,34] Thus, the food preparation group showed positive treatment effects in the environmental aspect of quality of life. There were no statistically significant differences between the two groups in the physical and social domains of the WHOQOL-BREF. The reason may be due to the duration of the food preparation program. Previous studies displayed that dietary and cooking interventions lasting 10 to 11 weeks caused a significant increase in overall quality of life.^[35,36] The food preparation program in this study was only administered for 6 weeks. Future studies could implement the food preparation program for longer periods (e.g., >10 weeks) to examine the impacts on the overall quality of life in stroke patients with dysphagia.

Regarding quality of life related to the process of swallowing, we noticed that there was no significant difference between the two groups, indicating that both groups had similar self-perceived quality of life associated with the process of swallowing. Two possible reasons might explain the non-significant findings between the two groups. First, we conducted oral motor exercises instead of swallowing training in the food preparation program. Secondly, the participants in this study had scores in the range of 5 to 7 in the Functional Oral Intake Scale, which means that they were able to eat by mouth.^[37] However, our results showed a small effect size between the two groups, which displays that the food preparation program has potential for improving quality of life with respect to the process of swallowing. We recommend that swallowing training be

included in the food preparation program to ameliorate swallowing difficulties in stroke patients with dysphagia.

Swallowing difficulties could contribute to malnutrition and physical weakness in patients affected with stroke.^[38] No significant difference was found from conducting Mann-Whitney *U* test for assessing the nutritional status between the two groups. However, the food preparation group appeared to show a better treatment effect with moderate effect size, which demonstrates that the food preparation program may help to improve their nutrition. There are two possible reasons which can explain the outcome of our results. First, all participants who suffered from stroke had a value of MNA >24 in both groups, indicating that they were well nourished. Secondly, due to the small sample size in our study, the Mann-Whitney *U* test could not achieve the required level of significance. Future studies recruiting large samples of patients with stroke with MNA <24 are warranted to cross investigate the effects of the food preparation program on nutritional status.

There were three limitations noticed in this study. First, the sample size was small and most of the participants had ischemic stroke, which restricts the generalization of our results. Further studies should be conducted on a large sample size with ischemic and hemorrhagic stroke and varied severities of swallowing difficulties. Second, we did not investigate the caregivers' quality of life during the participation of the food preparation program. The burdens of food preparation may result in poorer quality of life on caregivers.^[39] Future studies could explore the caregivers' perceptions of the food preparation program. Third, we used six categories of food in the food preparation program, not including enzymes. Enzymes have been applied in food industries to improve flavor, texture, and digestibility.^[40] Future studies may use enzymes in the food preparation program to cross-validate our findings.

5. Conclusions

The 6-week food preparation program with a small sample of stroke patients with dysphagia showed positive effects on patients' self-perceived dietary well-being. Moreover, patients who participated in the food preparation program showed potential improvements in their health-related quality of life, quality of life associated with the process of swallowing, and nutritional status. Therefore, it is recommended that stroke patients with dysphagia attain sufficient knowledge and prepare food hands-on to facilitate their dietary intake and overall well-being. Large sample sizes are required to study the effects of food preparation programs in the future.

Author contributions

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Writing – original draft: Yi-Chi Tsai, En-Chi Chiu.

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