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Diet Management with Dysphagia Condition in Stroke Patients: A Literature Review

Pengelolaan Diet dengan Kondisi Disfagia pada Pasien Stroke: Literature Review

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ABSTRACT

Background: Dysphagia is a condition often encountered in stroke patients and is a significant treatment challenge because it can increase the risk of malnutrition which can cause complications and increase the length of hospital stay.
Objectives: This article aimed to determine diet management with dysphagia conditions in stroke patients through a review of the results of previous studies.
Discussion: Diet management in stroke patients with dysphagia in the reviewed articles are nutrition screening, nutritional assessment, high-energy, high-protein feeding, energy restriction for weight loss, and provision of protein to maintain muscle mass. The dietary prescriptions were energy and protein adjustments, protein adjustments, fluid adjustments, nutritional supplements, food form adjustments, and feeding routes. The food preparation program uses a Dietary Well-being questionnaire assessment. This questionnaire consists of 21 questions which are divided into 4 categories, namely physical (5 questions), psychological (6 questions), emotional (5 questions), and social (5 questions). Modified Starch (MS) and Xanthan Gum (XG) thickeners use Volume-Viscosity Swallow Tests and Videofluoroscopic assessments to evaluate swallowing safety in stroke patients.
Conclusions: Diet management in stroke patients can improve nutritional status, physical function, and dysphagia conditions and reduce the length of hospital stay. The food preparation program showed significant results on the Dietary Well-being questionnaire in the control group, especially in the psychological, emotional, and social categories. MS and XG thickeners improved swallowing safety in stroke patients.

INTRODUCTION

Stroke is a disease caused by the blood supply to the part of the brain being disrupted[1]. A stroke occurs due to disruption of the blood supply to the brain due to rupture of blood vessels or blocked blood vessels. Blockage of blood vessels causes a cut off of the supply of oxygen and nutrients, damaging brain tissue[2]. Stroke consists of two types, namely, ischemic stroke and hemorrhagic stroke. As many as 80% of stroke cases occur in ischemic stroke when the blood supply to the brain stops or is disrupted due to a blockage in an artery that blocks blood flow to the brain. Transient ischemic attack (TIA) is one of the ischemic stroke attacks. TIA occurs when the blood supply to the brain is temporarily cut off. Hemorrhagic stroke occurs in 20% of stroke cases, with a higher risk of increased mortality and morbidity from ischemic stroke[1].

Globally, One out of four 25-year-olds will have a stroke in their lifetime. There are at least 13.7 million cases of new strokes every year. Globally, at least 80 million people are currently affected by a stroke[3]. Stroke prevalence in Jilin Province (China) was reported at 7.2%. By type, reported 91.7% were ischemic stroke and hemorrhagic stroke 8.3%. The risk factors for ischemic stroke in Jilin are hypertension, dyslipidemia, and lack of exercise, while the risk factors for hemorrhagic stroke are hypertension[4]. Stroke prevalence in Indonesia is extensive at 10.9%, with most stroke events in the age range >75 years, which is 50.2%. The highest prevalence of stroke is in East Kalimantan (14.7%) and the lowest in Papua (4.1%)[5].

Stroke is one of the most likely neurological pathological conditions associated with dysphagia, which is a condition of difficulty swallowing liquids and/or food. One-third to two-thirds of stroke patients experience dysphagia. In practice, dysphagia is a significant treatment challenge because it can increase the risk of malnutrition, which can cause complications (infection, decreased quality of life, increased death) and increase the length of stay in hospital[6,7]. The incidence of dysphagia, which depends on the location and volume of the lesion after stroke, is found in approximately 55% of patients hospitalized with acute illness. This dysphagia condition can persist as a chronic problem for years. It is

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estimated that every year there are 21,000 new elderly patients with dysphagia post-stroke in Canada and 200,000 in the United States. Of these patients, as many as 10,000 in Canada and 100,000 in the US continue to experience dysphagia for months after the initial stroke event[7].

A study about dextra hemiparesis stroke patients at Dadi Hospital, South Sulawesi Province, which receives standard nutritional care, showed how the patient's energy consumption level has increased to 80%, which means good[8]. Research conducted by Lieber et al.2018 found that post-stroke vitamin and mineral supplementation can prevent depression and fractures and allow increased blood flow to the ischemic area. Post-stroke therapy programs have been proven to lead to higher adherence to a healthy diet and lifestyle[9]. Based on this background, this review aimed to know diet management in stroke patients with dysphagia.

METHODS

This research used a literature review with the narrative method, conducted in September-November 2021. Retrieval of study data from journals published in 20112-2021. Article selection referred to Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Statement using the PubMed database and EBSCO. The search keyword is food AND, dysphagia, AND strokes.

A total of 1779 literature was obtained, consisting of 29 Pubmed and 1750 EBSCO articles. The inclusion criteria of this study were men and women experiencing dysphagia caused by stroke and discussing diet management. Articles will not be used if (a) outside the inclusion criteria, (b) review articles, and (c) do not discuss diet management with condition dysphagia in stroke patients, as presented in Figure 1.

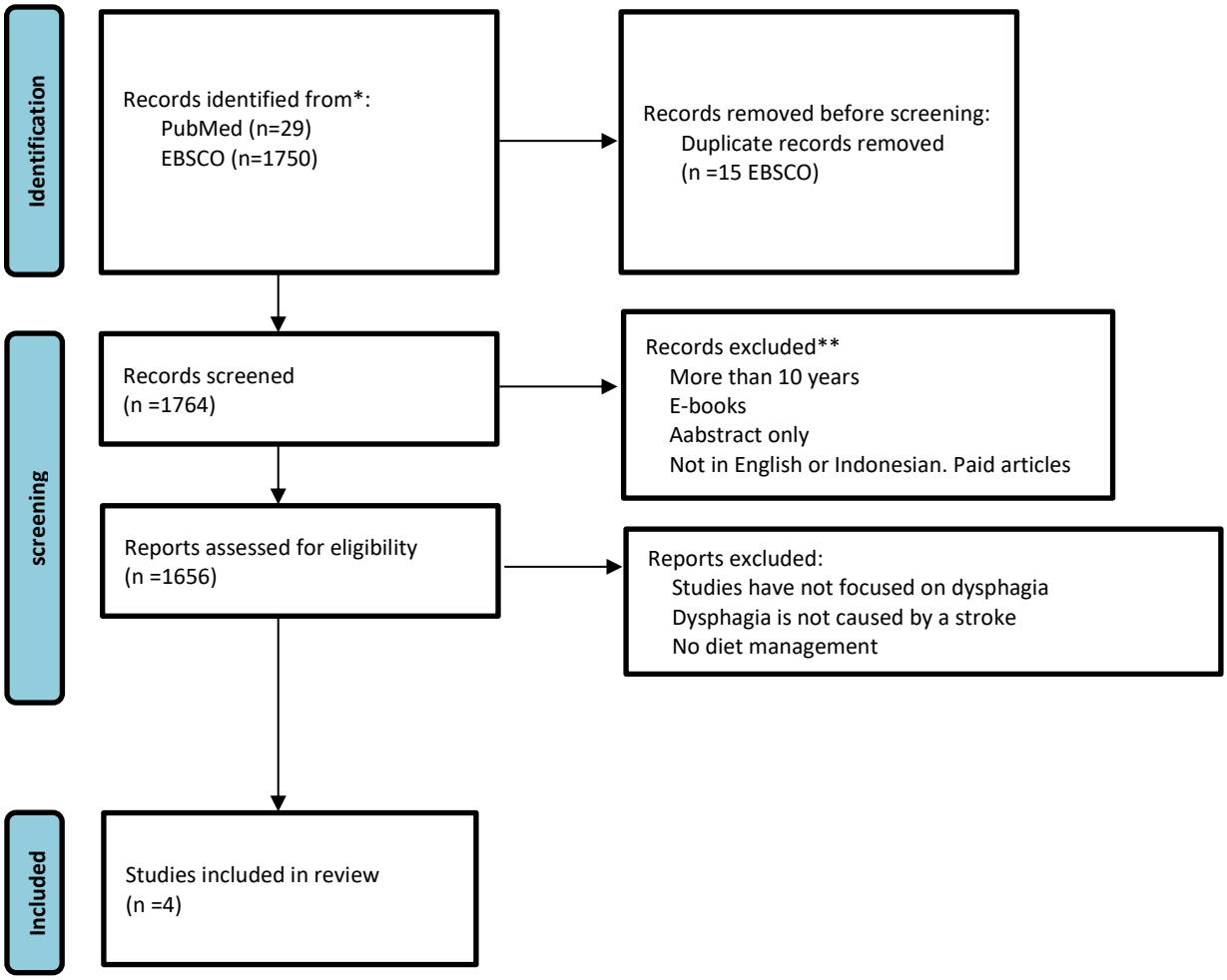

Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flowchart

DISCUSSION

Non-communicable diseases (NCD) are a significant health problem globally, with 63% of deaths projected to increase by 15% between 2010 and 2020. The most commonly reported NCDs are diabetes, chronic respiratory disease, and cardiovascular[10]. NCD is the second leading cause of death after ischemic heart disease is stroked accounting for 11.13% of total deaths, and the leading cause of disability worldwide[10,11]. The average length of stay in the hospital for patients with

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dysphagia was 8.8 days, and for patients without dysphagia, it was 5.0 days. The average total hospitalization cost was $6,243 higher in patients diagnosed with dysphagia[12].

The type of feeding depends on the swallowing condition of the stroke patient. Stages of feeding in the acute phase (24-48 hours) are given in the form of clear liquid, viscous liquid, or a combination orally (without dysphagia) or through a tube Nasogastric Tube (NGT), Percutaneous Endoscopic Gastrostomy (PEG), Percutaneous Endoscopic Jejunostomy (PEJ) according to the clinical condition of the patient. In the recovery phase, when the patient is conscious, still in a state of dysphagia or no dysphagia, can be given food according to the patient's ability (i.e., in the form of food liquid, strained, soft, or plain)[1,13].

A study by Shimazu et al.[14] in stroke patients who receive rehabilitation (up to 3 hours/day) according to the functional abilities of the individual patient, one of which is rehabilitation for dysphagia. Various methods and exercises have been used in clinical practice to treat dysphagia. Methods directly related to the use of food through adjustment of diet and changes in patient's body position are valuable and different, whereas the indirect method is associated with stimulation or swallowing techniques without the direct use of food, which is usually done when at least 10% of the food that enters the mouth is swallowed or takes 10 minutes or more to pass through the mouth and pharynx[15]. A total of 3,352 diet prescriptions were given to 426 patients during their stay in the hospital for about three months. The highest number of dietary prescriptions (1,277) was administered to patients with dysphagia, followed by energy and protein fortification (1,135) to patients via oral intake. Diet prescriptions for enteral and parenteral feeding are rare compared to diet prescriptions via the oral route of administration. This study found that an average of five diet prescriptions were issued per patient during a 3-month hospital stay. The results show that giving diet prescriptions to patients during a three-month treatment atHouse Sickcan improves nutritional status, reduces the length of stay in the hospital, and improves physical function and dysphagia[14].

Nutrition management during hospitalization is adjusted to meet the needs of the patient's nutritional and functional status, including nutritional screening, nutritional assessment, provision of high-energy, high-protein foods for malnourished patients, restrictions energy for weight loss, and providing sufficient protein to maintain muscle mass in obese patients[14]. Modifying the consistency of solids and/or liquids is an intervention used for patients with dysphagia. The goal of dietary modification is to improve safety and/or facilitate oral consumption to maintain food or oral fluids for the patient[16]. Modifying food texture is routinely carried out to improve food quality and safety. Liquid-containing foods can be modified by thickening them by increasing their viscosity to prevent aspiration, which allows higher amounts of food intake for dysphagic patients[17]. The weakness of the study conducted by Shimazu et al. 2020[14] was that the study was conducted in only one post-stroke care acute hospital in Japan, which may limit the total research result. Limitations of the study design prevented researchers from obtaining in-depth information about the quality and quantity of stroke treatment and rehabilitation programs and the knowledge and skills of medical staff. There is no proven causal relationship because the research uses an observational study design[14].

Research conducted by Mc Curtin et al. 2018[18] found that, according to respondents, thick liquid food is routine care for people who have had a stroke. A viscous liquid diet is not a diet of choice but one that is safe and has been used therapeutically to manage dysphagia[19]. Thick liquid food is easier to swallow and will enter the pharynx slowly, so there is time for passage to the lungs to be closed to prevent aspiration and choking[20]. Furthermore, the study's results found that consuming dense liquid food provides an unpleasant sensory experience, ultimately affecting the respondent's enjoyment of eating and giving unpleasant memories. Compliance of patients who receive thick liquid food often decreases. Low adherence to thick liquid foods can lead to reduced fluid intake and an increased risk of dehydration. Patient dissatisfaction is a factor causing disobedience to diet. In addition, it was found that for patients who received a thick liquid diet, their fluid needs were not met because this diet was usually given in small portions (for example, 185 ml)[21].

A study by Lin et al.[22] is a pilot project regarding a food preparation program that is carried out for 14 people in each group intervention. The intervention group was divided into the control and treatment groups, stroke patients with dysphagia. The treatment group received an intervention related to the food preparation program for one hour every week for six consecutive weeks. The control group did not receive any intervention related to the food preparation program. One certified dietitian is responsible for administering the food preparation program intervention. In the first week, education is given regarding choosing healthy foods, maintaining a balanced diet, and choosing the right food ingredients. There is education related to food consumption, especially fruits and vegetables, and high-fat foods sodium showed a change in food consumption of stroke patients to be healthier. In addition, education related to nutrition given in the early phase shows results that are more effective in reducing the risk of a second stroke[23]. In the second week, they introduced foods with a thick liquid texture using natural ingredients such as lotus root flour, soy flour, powdered milk, sesame powder, rice flour, ground almonds, and ground hazelnuts[22]. Thick liquid foods reduce the risk of aspiration occurs. The modified quality of viscous liquid food has a different effect depending on the type of thickener used, temperature, and individual ability to make viscous liquid food[24]. In the third week, high-energy foods are introduced[22].

Malnutrition is one of the consequences of stroke, especially in stroke patients with dysphagia, and increases mortality, so it is necessary to pay attention to the energy needs of stroke patients. If necessary, stroke patients can be given high-energy foods to prevent malnutrition[13].In the fourth week, they introduced how to arrange the menu[22]. In a study by Larsson, stroke patients exposed to the diet had risk-diagnosed decline

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ischemic stroke[25]. Week five introduces soft food recipes that are easy to chew and bite[22]. The risk of malnutrition in stroke patients with dysphagia is quite significant, so it is necessary to modify the menu. Patients with a modified diet tend to experience a decrease in nutritional intake, so it is recommended that if the patient has an improvement in dysphagia, the texture of the food is adjusted so that it becomes regular food[16]. In the sixth week, the last week, introduce a balanced, nutritious diet and modify the texture so the patient does not get bored.

The research by Lin et al.[22] showed significant differences in the treatment group given the food preparation program compared to the control group regarding the Dietary Well-being questionnaire, especially in the psychological, emotional, and social categories. This study shows that stroke patients with dysphagia need the food preparation program because it provides them with new knowledge and information about food processing, especially during rehabilitation. This finding aligns with research conducted by Pritlove et al. that the existence of interventions related to culinary increases satisfaction in post-cancer stroke patients[26]. However, it should be noted that this study found some limitations that need to be considered, especially if you want to adopt this pilot study in Indonesia. One is a limited research sample, so you should do a pilot study with a more extensive research sample if you want to adopt it. Second, it is recommended to include patient caregivers in the food preparation program and ensure they receive the same education because different backgrounds will have different effects[22].

A study by Vilardel et al.[27] demonstrated that thickeners using Modified Starch (MS) and Xanthan Gum (XG) increased ingestion safety. Thickeners are agents with the capacity to bind water. MS is a carbohydrate polymer composed of amylose and amylopectin, which can absorb water and swell, increasing the liquid's viscosity. MS has limitations in taste and viscosity stability. The resulting solution has been described as having a powdery taste and grainy texture, increasing viscosity over time due to continuous water absorption and hydrolysis caused by contact with amylase in saliva. Recent developments of gum-based thickeners are coming into use. Xanthan gum (XG) combines and forms new tissues quickly and steadily. In contrast to MS, XG has a better taste and consistency that is stable over time and unaffected by amylase.

Xanthan Gum (XG) is a crucial exopolysaccharide produced by Xanthomonas campestris under special conditions, which must be carefully evaluated to obtain the optimal combination of gum yield and product quality with production costs. The main application of XG is in the food industry as an emulsifier and thickening agent. XG has the texture, thickness, taste, appearance, and water control properties of current food product regulations[28].

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Table 1. General characteristics of research based on references, design and result

Author, Year, and Title	Journal Name	Year/Volume/Country	Research Design	Research Result
(Shimazu et al., 2020) "Frequent and personalized nutritional support leads to improved nutritional status, activities of daily living, and dysphagia after stroke."	Nutrition	2020/ 83/ Japan	Research Design: A single-center prospective cohort study. Research Subject: 426 post-stroke patients treated in recovery rehabilitation wards. Diet Management: 1. Nutrition screening, nutritional assessment, high protein, high energy food for malnourished patients, calorie restriction for weight loss, and sufficient protein to maintain muscle mass in obese patients. 2. Energy requirements are estimated at 25-35 kcal/kg/day. Protein requirements are estimated at 0.8-1.2 g/kg BW/day, based on the patient's age, sex, physical activity, and kidney function. 3. Diet prescriptions are categorized as follows: Energy and protein adjustments, Protein adjustments, Fluid adjustments, Providing nutritional supplements, Adjusting food forms (especially for dysphagia, such as soft diets, jellies, and thick liquids), Adjusting cutlery, Adjusting feeding times, certain diseases, and unique nutritional balance (especially for kidney disease, liver disease, and diabetes). It also pays attention to the route of administration (oral, enteral, or parenteral).	This study found that five dietary prescriptions were given to each patient during their 3-month hospital stay after the stroke. In addition, the frequency of dietary prescriptions was associated with improved nutritional status, physical function, dysphagia, and shorter hospital stays. Strokes.
(McCurtin et al., 2018) "Plugging the patient evidence gap: What patients with swallowing disorders post-strokes say about thickened liquids."	International Journal of Language and Communication Disorders	2018/53/Ireland	Research Design: A qualitative, descriptive study. Research Subject: A purposive sample of 14 adults.	1. Respondents considered thick liquid food routine care for people with a stroke. 2. Respondents reported that they disliked the sensory aspects of viscous liquid food and reported that it negatively affects the

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			Diet Management: 1. Respondents were given viscous liquid food. 2. The duration of giving viscous liquid foods ranged from 1 week to 3 years post-stroke.	enjoyment of drinking and fluid consumption. 3. Respondents concluded that even though giving viscous liquid was unpleasant, they understood its purpose.
(Lin et al., 2021) "Effect of Food Preparation Program on Dietary Well-being for Stroke Patients with Dysphagia: A Pilot Study"	medicine	2021/100:25/Taiwan	Research Design: Single-blinded pilot randomized clinical trial. Research Subject: Control and treatment of each 14 samples. Diet Management: 1. The food preparation program was carried out for 6 weeks, where 1 group consisted of 3 to 4 stroke patients. 2. Assessment using the DWB questionnaire (Dietary Well-being). This questionnaire consists of 21 questions divided into 4 categories, namely physical (5 items question), psychological (6 items question), emotional (5 items question), and social (5 items question). 3. Each week, a specific topic is provided in stages.	1. The results showed significant differences between the control and treatment groups in the 4 DWB categories (physical, psychological, emotional, and social). 2. The three DWB categories (psychological, emotional, and social) significantly differ. This shows that the food preparation program has a more significant effect on the treatment program. 3. Food intake impacts psychological aspects, emotional aspects, happiness, and social support. 4. Patients in the treatment group can increase their knowledge regarding food preparation (texture and thickness) and consult nutritional needs with a nutritionist who can meet psychological, emotional, and social needs. 5. Patients in the control group showed lower scores on DWB after 6 weeks.
(Vilardell et al., 2015) "A Comparative Study Between Modified Starch and Xanthan Gum Thickeners in Post-Stroke Oropharyngeal Dysphagia"	Dysphagia	2015/Spain	Research Design: A retrospective study. Research Subject: Respondents in this study amounted to 122 people consisting of:	1. The V-VST results showed that thickeners (MS and XG) increased ingestion safety. The prevalence of safe swallowing increases significantly with increasing viscosity. MS: 47.83% in liquid viscosity, 84.93% in honey thickness, and 92.96% in solid

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Group 1: Patients from January 2012 to April 2013 who received Modified Starch thickener during clinical assessment and VFS (46 persons).
Group 2: Patients from June 2010 to October 2011 who received Xanthan gum (XG) viscous during assessment (76 persons).

Diet Management:

1. MS (Resource ThickenUp_, Nestle' Health Science, Vevey, Switzerland). Bolus V-VST (Volume-Viscosity Swallow Test) to obtain the consistency of aqueous liquid by dissolving MS using mineral water at room temperature, to obtain the consistency of honey by dissolving 4.5 g/100 mL of MS. Then to get a denser thickness by adding 9 g/100 mL. VFS solution (Videofluoroscopic) with MS was obtained by mixing 1:1 mineral water and X-ray contrast Gastrografin (Bayer Hispania SL, Sant Joan Desp, Spain) at room temperature. An aqueous solution was obtained by mixing 1:1 mineral water and X-ray contrast for a thicker consistency made by adding 3.5 g/100 mL MS and a denser consistency by adding 8 g/100 mL. Solutions were prepared 5 minutes before starting V-VST and 10 minutes before VFS.
2. XG (Resource ThickenUp Clear, Nestle' Health Sains, Lausanne, Switzerland). For the V-VST study with XG, the viscosity of the aqueous liquid was obtained using mineral water at room temperature, the consistency of honey by adding 1.2 g/100 mL of XG, and the denser consistency by adding 6 g/100 mL. VFS solution was obtained by mixing 1:1 mineral water and Gastrografin X-ray contrast at room temperature. An aqueous solution is obtained by mixing 1:1 mineral water and X-ray contrast. The consistency of honey is thick by adding 2.4 g/100 mL XG and denser thickness; XG: 55.31% in liquid viscosity, 77.78% in honey thickness, and 97.84% in solid thickness.
2. Patients who had MS showed a higher prevalence of pharyngeal residues in solid viscous.
3. VFS results showed that increasing bolus viscosity with both thickeners (MS and XG) increased the prevalence of safe swallowing. MS 30.25% in liquid viscosity, 61.07% in mad viscosity, and 92.64% in stable viscosity. XG: 29.12% for liquid consistency, 71.30% for honey thickness, and 89.91% for solid consistency.
4. The occurrence of aspiration decreased significantly with increased viscosity of both thickeners (MS and XG). MS increased oral and pharyngeal residues on honey viscosity and viscosity but no residue on XG.
5. The airway mechanism and bolus rate were not affected by either of the identifiers. Increased bolus viscosity in MS and XG can improve swallowing safety in dysphagia in stroke patients. In contrast, only MS thickener increases the oropharyngeal residue.

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	consistency by adding 5.4 g/100 mL. Solutions with XG thickener were prepared 5 minutes before V-VST and 3 hours before VFS, respectively, to obtain a thickness equivalent to MS bolus as previously described.	

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CONCLUSIONS

In conclusion, the four articles suggest that stroke patients with dysphagia are given thick liquid food, and texture modification diets include pasta, jellies, mousses, and soft foods. Diet prescriptions for enteral and parenteral feeding are rare compared to diet prescriptions via the oral route of administration. Providing a diet to stroke patients can improve nutritional status, physical function, and dysphagia and reduce the length of stay in the hospital. In addition, there is a six-week food preparation program that is given in stages every week. The existence of a food preparation program showed significant results in the control group's Dietary Well-being questionnaire in the psychological, emotional, and social categories. Patients in the control group showed lower scores on DWB after six weeks. Thickeners using both MS and XG improve swallowing safety in stroke patients, even though MS thickeners have oropharyngeal residues.

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