



DYSPHAGIA TOWARDS NUTRIENT INTAKE AND MALNUTRITION CASE IN STROKE PATIENTS: LITERATURE REVIEW

Hafika Yunisari Pradina^{a*} ; Ria Ambarwati^b

^{a,b} *Dietitian professional study program ; Poltekkes Kemenkes Semarang
115 Wolter Monginsidi Street ; Semarang 50912 ; Indonesia*

Abstract

Dysphagia is one of the most important clinical manifestations of stroke and can pose a greater risk of malnutrition for patients during and after hospitalization. The purpose of this research is to review the literature about dysphagia on nutrient intake and malnutrition case in stroke patients. Type of the research is literature review which consist of journals cited the incidence of stroke patients suffered Dysphagia from 2015–2020 year of national and international publication. The result of dysphagia people can only consumed 10–33% of nutrient intake during 2 weeks and 3 months at home. This condition is insufficient for the energy and nutritional needs of the patient and can effect malnutrition case due to dysphagia which is 6-78%. The enteral formula can be obtained to reach energy and nutrients by focusing to the stroke patient treatment. Dysphagia experienced by stroke patient will affect nutrient intake and the malnutrition case. The suggestion of this paper is pointed to the health workers and the family of dysphagia people to concern energy and nutrients needs of the patient regularly.

Keywords: *dysphagia; nutrient intake; malnutrition; stroke*

1. Introduction

Dysphagia is one of the most important clinical manifestations of stroke disease where dysphagia can be interpreted as difficulty in skipping food bolus efficiently and safely within food pathways (Ortega Barrio, Valiñas Sieiro, Almarza Fernández, Bravo Santamaría, & Moreno Maestro, 2019). In addition to the age factor and neurological disorders, dysphagia is associated with lower capacities to maintain adequate dietary intake (Cristina Dessuy Vieira, Cristina Callegaro, Schmidt Pasqualoto, & Beatriz Bento Franz, 2018) which less than 50 percent intake that can be consumed stroke patients i.e 33 percent in fulfilling energy needs and only 10 percent of those who can stand the needs within 2 weeks after admission to the hospital (Adam C. Lieber, Estee Hong, David Putrino, Dominic A. Nistal, Jonathan S.Pan, 2018) and the problem leads to greater risk of malnutrition during hospitalization and so does

the after (Cristina Dessuy Vieira et al., 2018). Protein intake and micro nutrients may affect the synthesis of antioxidants due to oxidative stress in stroke conditions (Cristina Dessuy Vieira et al., 2018). The level of serum albumin can become nutritional status mark (such as malnutrition) without inflammation and infection (Leem, Moon, & Kim, 2018).

The incidence of malnutrition after stroke disease has been reported at 6–62 percent so that the decreased nutritional status after stroke is an important issue associated with functional negative improvements and mortality (Kasim, Pateda, Hadju, & Jafar, 2017). The research in Europe recommends monitoring nutritional status and modification of food textures for patients experiencing swallowing disorders to prevent malnourished risk. The purpose of the modification is to increase safety and to facilitate oral consumption (Cristina Dessuy Vieira et al., 2018). Malnutrition that occurs in stroke patients need more attention in improving nutritional status, hence the patients can perform well-day

*) Corresponding Author (Hafika Yunisari Pradina)
E-mail: pradinahafika@gmail.com

activities (Nishiyama, Wakabayashi, Nishioka, Nagano, & Momosaki, 2019).

Stroke patients with dysphagia would affect 18 to 81 percent of the patient's quality of life in the acute phase of the disease (Cristina Dessuy Vieira et al., 2018). The fulfillment of energy needs and nutrients should be observed for stroke patients in the hospital and at home. As many as 20 percent of patients who suffer from stroke might require enteral feeding during the acute phase, 8 percent would require long-term enteral feeding for more than six months (Ojo & Brooke, 2016). The provision of oral or enteral feeding needs to be considered safety and freshness in patients, and the family

should be supported well-equipped and appropriate knowledge. Therefore, this literature study will discuss about the dysphagia of nutrient intake and the malnutrition case in stroke patients based on national and international reviewed journals.

2. Method

The research method used was review literature. The type of research used from the reviewed journals were cross sectional, Randomized Controlled Trial (RCT), quasi experiment, cohort study, a retrospective observational study, prospective study, a

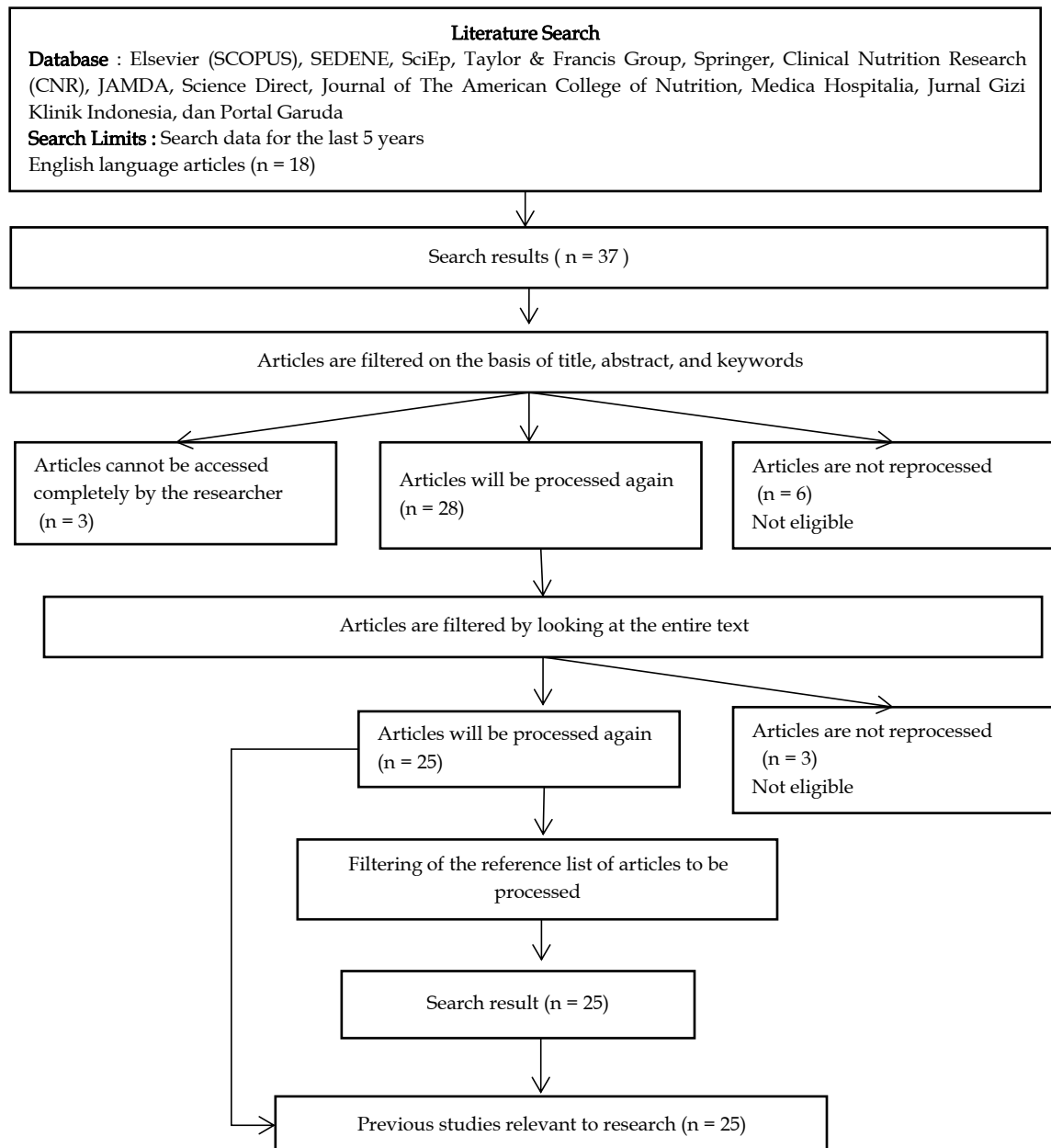


Figure 1. Flow Diagram Literature Review Based on The PRISMA 2009, modified by author

retrospective cohort study, retrospective single center study, a retrospective chart review, observational study, and case studies. Research respondents in reviewed journals were the stroke patients with dysphagia and experienced malnutrition case. The keyword used in searching research journals were dysphagia, malnutrition, nutrient intake, and stroke.

Research study was taken from journals that correspond to the inclusion criteria of the dysphagia topics, intake of nutritional substances stroke patients, and malnutrition of stroke patients. The journals source found out through online databases Elsevier (SCOPUS),

SEDENE, SciEp, Taylor & Francis Group, Springer, Clinical Nutrition Research (CNR), JAMDA, Science Direct, Journal of The American College of Nutrition, Medica Hospitalia, Journal of Nutritional Clinics in Indonesia, and Garuda Portal. The year restriction of data retrieval is a published journal for the last 5 years (2015-2020). Data collection is carried out by systematically extracting data according to title, abstracts, and keywords and then analyzing the data qualitatively by compiling, synthesizing, criticizing, and summarizing the result of research. Inclusion and exclusion criteria can be seen in table 1.

Table 1. Inclusion and Exclusion Criteria

Criteria	Inclusion	Exclusion
Population	The study consisted of patients who had a stroke and dysphagia	The study consisted not of patients who had a stroke and dysphagia
Intervention	Diet for stroke and dysphagia patient intervention	Non-Diet for stroke and dysphagia patient intervention
Comparators	No comparator	
Outcomes	Explain the effect of dysphagia on nutritional intake and the incidence of malnutrition in stroke patients	No explain the effect of dysphagia on nutritional intake and the incidence of malnutrition in stroke patients
Study Design and Publication type	cross sectional, Randomized Controlled Trial (RCT), quasi experiment, cohort study, a retrospective observational study, prospective study, a retrospective cohort study, retrospective single center study, a retrospective chart review, observational study, and case study	No exclusion
Publication years	Post-2015	Pre-2015
Language	English, Indonesian	Language other than English and Indonesian

3. Results and Discussion

An overview of Stroke and Dysphagia

Male gender factor has a higher tendency to be affected stroke disease rather than women (1.3:1) (Isti Suryani, Nitta Isdiany, 2018). This is because women have an estrogen hormone that can protect the lives of women until passing through the childbearing times (Aditya Purnama Meidarahan, Fakhrurrazy, 2019). Many factors can attack men to have more risky including smoking habits, drinking alcohol, hypertension, and hypertriglyceridemia (Karunia, 2016). The changeable risk factor requires good management of risk factors to prevent stroke (Arif, 2017).

Impaired brain function due to this stroke both focal or global (thorough) which lasts fast and lasts 24 hours or more by getting impaired brain blood flow can cause of death, without other causes other than vascular disorders (Arif, 2017). Disruption of this function can emerge dysphagia and will affect the intake of nutrients daily patients. The dysphagia is interpreted as trouble

in swallowing normally and effectively so the food will not reach the stomach regularly. Dysphagia is divided into the oropharyngeal dysphagia which located in the oral cavity and dysphagia esophageal which placed in the esophagus. This dysphagia can be temporary and permanent condition (Holdoway & Smith, 2010). Table summary data literature review can be seen in the table 2.

Dysphagia of nutrient intake to stroke patients

Based on the results, it is known that stroke patients suffering dysphagia can only consume an intake of 10-33% (less than 50%). In the review journal, there was a decrease in energy intake and nutrients observed during 2 weeks in hospitals and 3 months even up to 6 months after the patient returned home. Stroke patients who were respondents aged 45 years and over and they were elderly. This is because elderly people have decreased the homeostasis of each organ, susceptible to various stressors and changes in the

environment, easily infected, and susceptible to defects resulting in decreased nutritional status and activity of daily living (Kokura & Wakabayashi, 2018).

Tabel 2. Summary Data Literature Review

Study	Study country	Study design	Number of participant	Topic
(Cristina Dessuy Vieira et al., 2018)	Brazil	Cross sectional	25	Dysphagia and stroke
(Juan et al., 2019)	China	RCT	111	Dysphagia and stroke
(Hagnyonowati, 2017)	Indonesia	Case study	1	Nutrient intake and stroke
(Arif, 2017)	Indonesia	Cross sectional	54	Dysphagia and stroke
(Kasim et al., 2017)	Indonesia	Quasi experiment with pre-test post test group design	26	Malnutrition and stroke
(Karunia, 2016)	Indonesia	Cross sectional	47	Nutrient intake and stroke
(Aditya Purnama Meidarrahman, Fakhurrrazy, 2019)	Indonesia	Cross sectional	37	Malnutrition and stroke
(Lisda Amalia, Fadila Arsanti, 2019)	Indonesia	Cross sectional	40	Malnutrition and stroke
(Untari, Kariasa, & Adam, 2019)	Indonesia	Quasi-experimental design with pre-test post-test control group design	46	Dysphagia and stroke
(Aliasghari et al., 2018)	Iran	Cross sectional	253	Malnutrition and stroke
(Mozzanica, Rosa, Scarponi, & Schindler, 2018)	Italia	Cohort study	161	Dysphagia and stroke
(Buoite et al., 2019)	Italia	A restro spective observatio nal study	95	Dysphagia and stroke
(Giovanni Morone, Marco Iosa, Teresa Paolucci, Luca Muzziolli, 2019)	Italia	Prospective study	767	Malnutrition and stroke
(Nishiyama et al., 2019)	Jepang	A retrospective cohort study	1105	Nutrient intake and stroke
(Shinta Nishioka, Kazumi Yamasaki, Kenji Ogawa, Kana Oishi, Yoko Yano, Yuka Okazaki, Ryusei Nakashima, 2019)	Jepang	A retrospective cohort study	113	Malnutrition and stroke
(Kokura & Wakabayashi, 2018)	Jepang	A retrospective cohort study	192	Malnutrition and stroke
(Shinta Nishioka, Hidetaka Wakabayashi, Emi Nishioka, Tomomi Yoshida, Natsumi Mori, 2016)	Jepang	Cross sectional	178	Malnutrition and stroke
(Sporns, Muhle, & Hanning, 2017)	Jerman	Retro spective single center study	73	Dysphagia and stroke
(Leem et al., 2018)	Korea	A retrospective chart review	120	Dysphagia and stroke
(Gowun Kim, Sora Baek, Hee-won Park, Eun Kyoung Kang, 2018)	Korea	A restro spective cohort study	147	Nutrient intake and stroke
(Kim & Lee, 2019)	Korea	Cross sectional	147	Nutrient intake and stroke
(Ortega Barrio et al., 2019)	Spainyol	Obervational, descriptive, longitudinal, and prospective studies	166	Malnutrition and stroke
(Hsieh et al., 2017)	Taiwan	Observational study	231	Malnutrition and stroke
(Ongun, 2019)	Turki	Observasional	42	Nutrient intake and stroke
(Linh, Hien, Trung, & Huong, 2018)	Vietnam	Cross sectional	60	Malnutrition and stroke

The decline of nutritional status significantly occurred at 60–80% of stroke patients suffering dysphagia. Furthermore, cited to Shinta Nishioka et al in Japan, the energy related to the expenditure of activity is 30% of total energy expenditure. The stroke patients suffered more than 6 months from the period of stay (onset), the expenditure of energy related activity is 35% of total energy expenditure, and total energy expenditure is 1.5 times the basal metabolic rate (Shinta Nishioka, Hidetaka Wakabayashi, Emi Nishioka, Tomomi Yoshida, Natsumi Mori, 2016). The average stroke patients in Indonesia is also known to have a nutritional status of less more ($\pm 80\%$) and the most type of stroke is an ischemic stroke (Kasim et al., 2017). This situation occurs as a result of the lack awareness of healthy lifestyle. Similarly, the study of Nguyen Thuy Linh et al in Vietnam, nutritional status data of patients showed that there is no patients with normal nutritional status, while 66.7% of them are considered malnourished. Patients in this study experienced severe dysphagia and thus it experienced malnutrition (Linh et al., 2018). Patients with the aforementioned risk factors should routinely undergo nutritional screening and assessment for the early identification and treatment of malnutrition, to reduce the morbidity and mortality correlated with post-stroke recovery (Chen, Li, Fang, Lu, & He, 2019).

Reviewed from the study of Stella et al in Italy, the respondents of the sample who could receive energy intake appropriately according to international guidelines were only 4.4% patients. The average energy intake is 14.0 ± 5.8 kcal which is greatly reduced in acute stroke patients during the first week of hospitalization (Buoite et al., 2019). The final result showed approximately by the research of Yoji Kokura et al in Japan and for ≤ 90 days the presence of average energy intake during the first week treatment was inconsistent (Kokura & Wakabayashi, 2018).

Examples of cases in male patients (54 years) who worked as a civil servant and hospitalized as a sample investigated by Hagnyonowati and Meika in the RSUP Kariadi, the initial need based on the calculation was 2100 kcal, 70 grams of protein, 58 grams of fat, and 288 grams of carbohydrates. Daily energy delivery can be varied due to the patient's ability consumption with liquid food texture (Hagnyonowati, 2017). Food texture changes gradually need to be adjusted to the patient's condition. Menu and daily groceries can be modified the look and the

texture without changing the flavor in order to increase the intake of dysphagia people. The provision of dietary drinks should be observed to avoid aspiration cause. The usage of this fluid coagulate is recommended to maintain a fluid intake of dysphagia that is mixed in beverages such as water, tea, coffee, juice, and gravy (Niken Puruhita, Rani Armeidani, 2016). Various consistencies can be tested to find out which is the safest to eat or drink. Management of dysphagia stroke patients can succeed by the cooperation of health workers, patients, and family members (Holdoway & Smith, 2010).

Recommended feeding strategies to dysphagia patients to maximize energy needs and nutrients should not be given food and beverages if the patient is unconscious or half-conscious. Furthermore, patients are suggested to have good concentration and awareness (Morris, 2018). This should be noticed because nutrients play an important role in the regeneration of brain cells and their physiological functions such as nerve impulses and interneuron connection (Lisda Amalia, Fadila Arsanti, 2019). Counseling and education of nutrition also need to be published on media as leaflet "Low Cholesterol Diet". The knowledge of food form modification is needed to the family of patient to keep nutrition intake at home (Hagnyonowati, 2017).

Dysphagia against malnutrition in stroke patients

Based on the literature studies, malnutrition status occurs in stroke patients with dysphagia, which is on average 6-62% up to 78% when the patient is discharged from the hospital in 3 months. The prevalence of dysphagia in stroke patients at the range of 20-30% results in malnutrition and has no difference in the prevalence of malnutrition between men and women. The incidence of malnutrition is associated with albumin and pre-albumin status which is less than 15-17 mg/dL. The weight loss in patients of malnutrition ranges from 3-4 kg during 2 weeks of hospitalization. The weight loss also occurs due to other complications in stroke patients such as diabetes mellitus, hyperlipidemia, and hypertension (Mozzanica et al., 2018). In addition, there were psychological and social reasons such as lack of interest in preparing their own food, social isolation, and depression due to the death of a close relative. In other words, malnutrition has multifactorial causes,

which need to be explored by health and social care professionals so they can provide effective nutritional interventions (Gomes, Emery, & Weekes, 2016).

The increment of enteral formulas is known not influence to the malnutrition case in patients. The average finding of patient can increase the risk of malnutrition significantly in all reviewed research journals. The prevalence of dysphagia in the study of Mozzanica F et al in Italy, according to the nursing staff at the hospital found that the evaluation results are known 39 patients (24.2%) of 62 patients who suffered dysphagia (Mozzanica et al., 2018).

The research in Iran estimated 15% of malnutrition in older adults is affected by dysphagia. This research sampled on 253 stroke people with dysphagia was shown that 34.4% suffered malnutrition, 42.3% suspected malnutrition risk, and 23.3% people well treated (Aliasghari et al., 2018). Whereas, according to ESPEN diagnostics in the criteria of malnutrition, 26 patients (16.2%) of 11 men and 15 women were identified as malnutrition. There is no difference in the malnutrition prevalence between men and women with the X comparison test ($p=0.521$) (Mozzanica et al., 2018). The percentage of malnutrition in stroke patients in the study of Barrio et al using the CONUT index, had decreased 77.1% in 3 months while the average of BMI was 27.3 and 27 in 3 months at initial entry, so it was concluded that stroke affects the nutritional status of the patient. Patients with malnutrition have a greater risk of secondary developing dysphagia of stroke. Conversely, patients who have experienced dysphagia while in hospital after 3 months later can increase the risk of malnutrition. The decrease of nutritional status post-stroke is a result of nutritional metabolic disorders caused by increased catabolic hormones that cause hypercatabolism and hyperglycemia (Kasim et al., 2017). The catabolic imbalance or global anabolic can occur by increasing catabolic and failed anabolic stimulation, especially in the phase acute after stroke. Since then, it becomes an important concern in weight loss and minimizing variations of Body Mass Index (BMI) during hospitalization (Giovanni Morone, Marco Iosa, Teresa Paolucci, Luca Muzziolli, 2019).

The malnutrition accident in patients aged 45 years old and over or elderly is caused by a deterioration in organ function. Factors of old age, severe stroke, and dysphagia can predict poor outcomes in stroke patients.

unconsciousness is also an indicator of stroke severity. Feeding through an enteral tube can be done if the patient is dysphagia or unable to meet the nutritional needs orally (Zhang et al., 2015). Described in the study of Sporns et al in Germany, it was proven that the muscles in the oral cavity and or pharynx had a significant decrease in volume of muscle as increasing the age (Sporns et al., 2017). Based on initial evaluation research at the hospital in Taiwan, the MNA score results, malnutrition was identified in 12.1% of patients study and malnutrition risk was of 54.1%. The risk of malnutrition is 40.0% and 36.4% of malnutrition patients. Neurological deficits such as dysphagia have an impact on nutritional status in difficulty adequate orally intake (Hsieh et al., 2017).

Unlike the study which conducted by Shinta Nishioka et al in Japan, the results showed that low of BMI, poor nutrition, poor dental occlusion status, and decreased salivary secretion were not risk factors for achieving full oral intake because almost all patients (96.5%) were a risk malnutrition according to MNA-SF. The results of this study were obtained based on Kaplan Meier analysis and the model of Cox proportional hazard (Shinta Nishioka, Kazumi Yamasaki, Kenji Ogawa, Kana Oishi, Yoko Yano, Yuka Okazaki, Ryusei Nakashima, 2019). It is recognized when evaluating the nutritional status of follow-up stroke patients in the hospital in terms of monitoring nutritional status with MNA and MAC scores more significant than blood parameters (serum albumin). This was obtained from the study of Nedim Ongun in Turkey, there is no significant differences between baseline and blood parameters in the fourth week ($p > 0.05$) (Ongun, 2019).

The level of albumin and pre-albumin is a marker of nutritional status cited by Min Jeong Leem et al in Korea. The results of the study found that there was a change in the nutritional status of 3 groups along the rehabilitation period of 2 months from the initial admission of stroke patient to the hospital. Elderly patients have lower serum albumin and reach the risk of nutritional deficiencies due to lack of nutrient reserves with long hospitalizations (Leem et al., 2018). It was explained that protein and micro nutrients can influence antioxidant synthesis due to oxidative stress in stroke conditions. High oxidative stress will trigger the damage of the cell. The presence of antioxidants can prevent the further damage (Lisda Amalia, Fadila Arsanti, 2019).

The possibility of stroke consequences includes mobility disorder, communication, dysphagia, and depression. Most patients after an acute stroke recover from dysphagia in the first four weeks, although 15% have the long-term of difficulty swallowing. While 20% of patients who have had a stroke may require enteral tube during the acute phase, 8% will require the long-term enteral more than six months (Ojo & Brooke, 2016). In the study of Dyah Untari et al in RSPAD Gatot Soebroto, the nutritional needs of patients are processed by installing NGT with liquid diet. After 3 days ahead, there is no significant decrease nutritional status in the treatment. The results of this study proved statistically that there is no correlation between nutritional status (LLA) and the risk of aspiration pneumonia in stroke patients who have decreased consciousness and dysphagia (Untari et al., 2019).

The enteral formulas given through nasogastric tubes have the aim to overcome the nutritional problems of stroke patients (Juan et al., 2019). If he feeding liquid food or with this enteral formula is not passed correctly, it will lead the aspirations which cause disruption in swallowing of patient. In the study of Gowun Kim et al, found that there is no significant decrease in nutritional status between before and after NGT was given to patients. The use of thickener in this enteral formula must be considered the viscosity of the liquid so that it can flow properly in the hose (Gowun Kim, Sora Baek, Hee-won Park, Eun Kyoung Kang, 2018). In Dasom Kim and Kyung-Eun Lee's research, thickener used is xanthan-based. In addition to administering fluids, the ordinary foods texture is often modified in the dysphagia diet to improve the nutritional status of stroke patients (Kim & Lee, 2019).

The incidence of malnutrition resulting the decrease of nutritional status is an important problem that associate with negative functional improvement and mortality in patient of stroke (Kasim et al., 2017). The incidence of malnutrition in patients of stroke suffered dysphagia was discussed by Anne Holdoway and Anita Smith, a dietitian consultant and therapist at Nutricia magazine Vol.34, 2020. Malnutrition can be a cause of dysphagia and dysphagia can additionally be a cause of malnutrition. The stroke patients who are choke and aspiration may be caused by dysphagia. Patients become afraid of eating which reduce their enjoyment of eating. The condition reduces food intake which caused malnutrition. On the

other hand, the early enteral nutrition can increase mortality which depends on the treatment. The benefit of the initial initiation on enteral nutrition after stroke in a coma is to support nutrient content within three days after hospitalization. The Giving of enteral formula can also cause stroke with diarrhea due to administration through an enteral tube. It becomes a concern that feeding in enteral formulas should not more than seven days so the nutritional status of the patient are not getting bad (Ojo & Brooke, 2016).

4. Conclusion and Suggestion

Less than 50% of the intake of nutrients can be consumed by patients of stroke with dysphagia during 2 weeks of hospitalization and or 3-6 months after the patient returns home. It causes a weight loss in patient of 3-4 kg. Lack of nutrient intake results malnutrition (the incidence of malnutrition of 6-8%). The level of albumin consumption is known to be below 15-17 mg/dL and can be used as an indication of malnutrition. Elderly patients have lower serum albumin and can increase the risk of malnutrition due to lack of nutrient with a long stay. The average of decreasing of nutrient intake and the malnutrition case occur in the acute phase of stroke patients. Probably, the patient feed liquid food or an appropriate eternal formula to avoid aspiration which causes swallowing in trouble. The good fulfillment of the energy and nutritional needs of patient will improve the quality of life. Furthermore, the family and health workers support in treating the patient of stroke suffering dysphagia is the matter. Hence, it can complete their energy and nutritional needs and also reduce the risk of malnutrition.

5. Acknowledgments

Thank you to Mrs. Ria Ambarwati, Mr. Setyo Prihatin, and Mr. Mohammad Jaelani as lecturer of Poltekkes Kemenkes Semarang who already supported and suggested the best advice to accomplish this paper well and hope it gives benefit for all the reader.

6. References

Adam C. Lieber, Estee Hong, David Putrino, Dominic A. Nistal, Jonathan S.Pan, C. P. K. (2018). Nutrition, Energy Expenditure, Dysphagia, and Self-Efficacy in Stroke Rehabilitation: A Review of the Literature.

- Brain Sciences*, 8(218), 1–12.
<https://doi.org/10.3390/brainsci8120218>
- Aditya Purnama Meidarahan, Fakhurrazzy, T. (2019). Hubungan Status Nutrisi Saat Masuk Rumah Sakit dengan Outcome pada Pasien Stroke Iskemik. *Homeostasis*, 2(1), 107–112.
- Aliasghari, F., Izadi, A., Khalili, M., Farhoudi, M., Ahmadiyan, S., & Deljavan, R. (2018). Impact of Premorbid Malnutrition and Dysphagia on Ischemic Stroke Outcome in Elderly Patients: A Community-Based Study. *Journal of the American College of Nutrition*, 0(0), 1–9. <https://doi.org/10.1080/07315724.2018.1510348>
- Arif, M. (2017). Hubungan pelaksanaan screening test menelan dengan kejadian disfagia pada pasien baru yang menderita stroke akut. *Jurnal Kesehatan Perintis*, 4, 61–67.
- Buoite, A., Gaio, M., Furlanis, G., Douglas, P., Naccarato, M., & Manganotti, P. (2019). Fluid and energy intake in stroke patients during acute hospitalization in a stroke unit. *Journal of Clinical Neuroscience*, (April 2020). <https://doi.org/10.1016/j.jocn.2019.01.016>
- Chen, N., Li, Y., Fang, J., Lu, Q., & He, L. (2019). Risk factors for malnutrition in stroke patients: A meta-analysis. *Clinical Nutrition*, 38(1), 127–135. <https://doi.org/10.1016/j.clnu.2017.12.014>
- Cristina Dessuy Vieira, D., Cristina Callegaro, C., Schmidt Pasqualoto, A., & Beatriz Bento Franz, L. (2018). Changes in Food Consistency Improve Quality of Life Related to Swallowing in Post-stroke Patients at Risk of Dysphagia Specialization in physical-motor rehabilitation, Postgraduate Program in Human Communication Issues. *Journal of Food and Nutrition Research*, 6(1), 62–68. <https://doi.org/10.12691/jfnr-6-1-10>
- Giovanni Morone, Marco Iosa, Teresa Paolucci, Luca Muzziolli, S. P. (2019). Relationship Between Body Mass Index and Rehabilitation Outcomes in Subacute Stroke With Dysphagia. *American Journal of Physical Medicine & Rehabilitation*, 98(7), 608–612. <https://doi.org/10.1097/PHM.00000000000001159>
- Gomes, F., Emery, P. W., & Weekes, C. E. (2016). Risk of Malnutrition Is an Independent Predictor of Mortality, Length of Hospital Stay, and Hospitalization Costs in Stroke Patients. *Journal of Stroke and Cerebrovascular Diseases*, 25(4), 799–806. <https://doi.org/10.1016/j.jstrokecerebrovasdis.2015.12.017>
- Gowun Kim, Sora Baek, Hee-won Park, Eun Kyoung Kang, G. L. (2018). Effect of Nasogastric Tube on Aspiration Risk: Results from 147 Patients with Dysphagia and Literature Review. *Dysphagia*, 33(6), 731–738. <https://doi.org/10.1007/s00455-018-9894-7>
- Hagnyonowati, M. R. A. (2017). Penatalaksanaan Gizi pada Pasien Stroke dengan Disfagia. *Medica Hospitalia: Journal of Clinical Medicine*, 3(3), 204–206. <https://doi.org/10.36408/mhjcm.v3i3.236>
- Holdoway, A., & Smith, A. (2010). Meeting Nutritional Need and Managing Patients with Dysphagia. *Nutricia*, 52–59.
- Hsieh, D., Hung, J., Chang, K., Huang, Y., Lee, T., & Chen, H. (2017). Malnutrition in Acute Stroke Patients Stratified by Stroke Severity- A Hospital Based Study. *Acta Neurologica Taiwanica*, 26(3), 120–127.
- Isti Suryani, Nitta Isdiany, G. A. D. K. (2018). *Dietetik Penyakit Tidak Menular* (Tahun 2018; Heny Kurniawati, ed.). Jakarta: Kementerian Kesehatan Republik Indonesia.
- Juan, W., Zhen, H., Yan-ying, F., Hui-xian, Y., Tao, Z., Pei-fen, G., & Jian-tian, H. (2019). Comparative Study of Two Tube Feeding Methods in Patients with Dysphagia After Stroke: A Randomized Controlled Trial. *Journal of Stroke and Cerebrovascular Diseases*, 1–9. <https://doi.org/10.1016/j.jstrokecerebrovasdis.2019.104602>
- Karunia, E. (2016). Hubungan antara dukungan keluarga dengan kemandirian. *Jurnal Berkala Epidemiologi*, 4, 213–224. <https://doi.org/10.20473/jbe.v4i2.2016.213>
- Kasim, V. N., Pateda, S. M., Hadju, V., & Jafar, N. (2017). Suplementasi ekstrak albumin ikan gabus terhadap status gizi dan. *Jurnal Gizi Klinik Indonesia*, 13(3), 91–98.
- Kim, D., & Lee, K. (2019). Nutrition Care Management Practices for In-Patients with Dysphagia in Korean Clinical Settings. *Clinical Nutrition Research*, 8(4), 272–283.

- Kokura, Y., & Wakabayashi, H. (2018). Nutritional Intake is Associated with Activities of Daily Living and Complications in Older Inpatients with Stroke. *Epidemiology, Clinical Practice and Health*, 25, 1-6. <https://doi.org/10.1111/ggi.13467>
- Leem, M., Moon, H. I., & Kim, K. H. (2018). Differences in Nutrition and Hydration Status Related to Swallowing Function and Age in Acute Stroke Patients. *Journal of Food and Nutrition Research*, 6(12), 719-724. <https://doi.org/10.12691/jfmr-6-12-1>
- Linh, N. T., Hien, B. T., Trung, N. D., & Huong, N. M. (2018). Nutritional Status , Dysphagia and Dietary Of Elderly Stroke Patients At Vietnam Friendship Hospital. *Journal of Medical Research*, 3(7), 60-67.
- Lisda Amalia, Fadila Arsanti, G. M. (2019). Hubungan Luaran Subjective Global Assessment (SGA) Dengan Derajat Keparahan Stroke. *Neurona*, 36, 170-175.
- Morris, H. (2018). Adapting mealtimes to residents with dysphagia. *MA Healthcare Ltd*, 20(12), 2016-2019. Retrieved from magaonlinelibrary.com
- Mozzanica, F., Rosa, S., Scarponi, L., & Schindler, A. (2018). Prevalence of dysphagia , malnutrition and dehydration at admission in a Stroke Unit. *Otorinolaringologia*, 68(1), 23-27. <https://doi.org/10.23736/S0392-6621.17.02137-3>
- Niken Puruhita, Rani Armeidani, A. K. (2016). Medica Hospitalia. *Medica Hospitalia : Journal of Clinical Medicine*, 3(3), 207-212.
- Nishiyama, A., Wakabayashi, H., Nishioka, S., Nagano, A., & Momosaki, R. (2019). Energy intake at admission for improving activities of daily living and nutritional status among convalescent stroke patients. *Neurologia Medico-Chirurgica*, 59(8), 313-320. <https://doi.org/10.2176/nmc.oa.2019-0002>
- Ojo, O., & Brooke, J. (2016). The Use of Enteral Nutrition in the Management of Stroke. *Nutrients*, 8, 1-6. <https://doi.org/10.3390/nu8120827>
- Ongun, N. (2019). Nutritional follow-up in patients with ischemic stroke: With a screening test or with blood parameters? *Annals of Medical Research*, 26(9), 1902-1906. <https://doi.org/10.5455/annalsmedres.2019.06.313>
- Ortega Barrio, M. Á., Valiñas Sieiro, F., Almarza Fernández, M. T., Bravo Santamaría, S., & Moreno Maestro, R. (2019). Effect of stroke on nutritional status and its relationship with dysphagia. *Revista Científica de La Sociedad de Enfermería Neurológica (English Ed.)*, (xx). <https://doi.org/10.1016/j.sedeng.2019.04.003>
- Shinta Nishioka, Hidetaka Wakabayashi, Emi Nishioka, Tomomi Yoshida, Natsumi Mori, R. W. (2016). Nutritional Improvement Correlates with Recovery of Activities of Daily Living among Malnourished Elderly Stroke Patients in the Convalescent Stage. *Journal of the Academy of Nutrition and Dietetics*, 116(5), 837-843. <https://doi.org/10.1016/j.jand.2015.09.014>
- Shinta Nishioka, Kazumi Yamasaki, Kenji Ogawa, Kana Oishi, Yoko Yano, Yuka Okazaki, Ryusei Nakashima, M. K. (2019). Impact of nutritional status , muscle mass and oral status on recovery of full oral intake among stroke patients receiving enteral nutrition: A retrospective cohort study. *Nutrition & Dietetics*, (December 2018), 1-11. <https://doi.org/10.1111/1747-0080.12579>
- Sporns, P. B., Muhle, P., & Hanning, U. (2017). Atrophy of Swallowing Muscles Is Associated With Severity of Dysphagia and Age in Patients With Acute Stroke Atrophy of Swallowing Muscles Is Associated With Severity of Dysphagia and Age in Patients With Acute Stroke. *Journal of the American Medical Directors Association*, (March). <https://doi.org/10.1016/j.jamda.2017.02.002>
- Untari, D., Kariasa, I., & Adam, M. (2019). Efektivitas Perawatan Mulut Menggunakan Madu Terhadap Risiko Pneumonia Aspirasi Pada Pasien Stroke Yang Mengalami Penurunan Kesadaran Dan Disfagia. *Journal Educational of Nursing*, 2(1), 26-38.
- Zhang, J., Zhao, X., Wang, A., Zhou, Y., Yang, B., Wei, N., ... Wang, Y. (2015). Emerging malnutrition during hospitalisation independently predicts poor 3-month outcomes after acute stroke: Data from a Chinese cohort. *Asia Pacific Journal of Clinical Nutrition*, 24(3), 379-386. <https://doi.org/10.6133/apjcn.2015.24.3.13>