



Improving nutrition knowledge and nutrient intake through nutrition education for post-stroke survivors and their families

Farah Faza¹, Lily Arsanti Lestari¹, Ismail Setyopranoto², Susetyowati^{1*}



ABSTRACT

Background: Malnutrition among post-stroke survivors is 14-52%. Nutrition knowledge reinforcement will be beneficial for the survivors and family/caregivers to maintain their nutritional status and improve quality of life.

Objectives: To examine the improvement of nutrition knowledge about nutrition management for post-stroke survivors, family, and caregivers as well as the improvement of nutrient intake and nutritional status among post-stroke survivors.

Materials and Methods: This study used pre-experimental design and was conducted in Embung Tambak Boyo, Sleman District during August 2018. The subjects were post-stroke survivors, being members of Happy Embung, and signing the informed consent. Total subjects were 27 post stroke survivors with 27 family/caregivers of them. This study consisted of a series of activities, as follows: pre-test and baseline assessment, i.e., anthropometry, blood pressure, physical function, and dietary were measured in the 1st week, a series of nutrition education in the 2nd and 3rd week, post-test and endline assessment in the 4th week. The paired sample T-test was employed to compare the differences between baseline data collected during the first week of intervention, and endline data, gathered in the final week of intervention.

Results: Most participants were male (89%) and aged 60 or older (82%). After two series of nutrition education, there were notable increases in nutritional knowledge score of the survivor and family/caregivers, body weight, BMI, HGS, and energy intake of the survivor (baseline vs. endline, mean \pm SE: 6.5 \pm 0.6 vs. 7.0 \pm 0.6; 8.8 \pm 0.3 vs. 9.3 \pm 0.3; 67.8 \pm 1.9 vs. 68.6 \pm 1.9; 29.5 \pm 0.8 vs. 29.8 \pm 0.7; 26.1 \pm 2.0 vs. 26.8 \pm 2.0; and 1334.5 \pm 75.7 vs. 1389.1 \pm 95.0, all $p < 0.05$). However, there was no significant improvement on MUAC, body fat total, protein, fat, and carbohydrate intake among the survivors.

Conclusion: Nutrition education might enforce nutrition knowledge of post-stroke survivors and family/caregivers, as well as nutritional status improvement among the survivors.

Keywords: Nutrition education; nutrient intake; nutrition status; post-stroke survivors

BACKGROUND

The national health survey conducted by the Ministry of Health (MoH) of Indonesia reported that stroke prevalence was 10.9 per mil adults in 2018, increased 4 points from 2013.¹ The report stated that Yogyakarta Province places 2nd highest prevalence of stroke in Indonesia¹. In a couple of decades, stroke was reported to be suffered by adults aged 60 years and above. However, in the industrialization era, there is a transition where people younger than 60 contribute to increase stroke prevalence rates by 22%.² The age transition should be acknowledged related to nutrition transition, where the dietary pattern is less healthy, and lifestyle is more sedentary.³

Those who suffered from stroke have some side problems that lead to eating difficulties, such as dysphagia, decrease in appetite, inadequate food intake, and impaired mobility. All those problems are manifested in dehydration and malnutrition.^{4,5,6} Previous studies reported that around 14 – 52% stroke patients experienced malnutrition during treatment.^{1,7,8} Another study found that the range of malnutrition suffered by stroke and post-stroke patients is 6.1% to 62%^{9,10}. Malnutrition must be crucially well-identified and treated because it is frequently associated with poor functional outcomes, more complications, prolonged hospital stays, higher mortality rates, and increased hospitalization costs¹¹. Therefore, diet management for stroke and post-stroke survivors should be well-implemented, involving some groups other than health workers, namely family, caregivers, even peers.^{12,13}

Family and caregivers have an essential role to encourage patients to have adequate and nutritious food intake to prevent recurrent stroke.^{14,15} As reported in a previous study, there is an association between family support and compliance to diet in patients with coronary heart disease, where the better support from family and caregiver, a higher the diet adherence¹⁶. Moreover, family support can maintain emotional strength and

¹Department of Health Nutrition, Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada, Yogyakarta, Daerah Istimewa Yogyakarta, Indonesia

²Department of Neurology, Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada, Yogyakarta, Daerah Istimewa Yogyakarta, Indonesia

*Correspondence: susetyowati@ugm.ac.id

provide family affection as well as attention to prevent recurrent strokes¹⁶. Thus, an understanding of recurrent strokes and specific knowledge of dietary management are important for family and caregivers, or even the patients to handle during acute and post-discharge phase.¹⁴

Several previous studies have described the knowledge levels among stroke survivors and how these levels improved through interventions such as education and reinforcement^{17,18}. A quantitative study conducted with 85 caregivers of post-stroke survivors in India found that the knowledge scores of caregivers in both the study and control groups improved after receiving a combination of interventions¹⁸. Another study conducted with 215 stroke survivors in Surabaya, Indonesia, reported that 76.7% of the participants had a low level of stroke knowledge.¹⁷ However, both studies also found that education and the duration since the stroke occurrence can significantly improve knowledge scores.^{17,18} A meta-analysis on nutritional educational interventions concluded that dietary education interventions are effective in promoting lifestyle and health status changes¹⁹. Therefore, specific nutrition information should be provided through some schemes such as nutrition education and counselling using booklet and food models, home visits, follow-up phone/video call, hands-on training, and emotional support and counselling.^{12,14,16}

The preliminary survey in Happy Embung, a community of post-stroke survivors under the Indonesia Stroke Foundation/*Yayasan Stroke Indonesia* (Yastroki), showed that post-stroke survivors often consuming foods high in cholesterol, saturated fat, sodium, and added sugar such as fritters, salty chips, and sweetened beverages. However, there is still no nutrition education program, causing a lack of information about nutrition management for post-stroke survivors and their families and caregivers, particularly regarding meal planning and body weight management. Therefore, nutrition knowledge reinforcement as a part of family-centered holistic nutrition care will be beneficial for the survivors, family as well as caregivers to maintain their nutritional status and improve quality of life. This community service aims to increase knowledge in post-stroke management, especially from nutrition perspective for post-stroke survivors, family as well as caregivers, and increase nutrient intake and improve nutritional status of post-stroke survivors.

MATERIALS AND METHODS

Study Design and Subjects

This study was conducted using pre-experimental design with one-group pre- and post-test in Embung Tambak Boyo, Sleman District, Special Region of Yogyakarta Province. The population in this study was members of Yastroki Yogyakarta, consisting of 35 post-stroke survivors and 30 caregivers of the survivors. Participants were purposively recruited with the following criteria: (1) being a post-stroke survivor, (2) being a member of Happy Embung, a community of post-stroke survivors under the Yastroki as the official organization, and (3) signing the informed consent. Survivors who were passing away during the period of community service activity and suffering from a recurrent stroke during the intervention period were excluded from this study. Finally, the recruited subject was 27 post-stroke survivors with 27 family members/caregivers.

The community service was carried out for 4 weeks from the 1st week to 4th week of August 2018. The duration of the interventions was four weeks, based on previous study in low- and middle-income countries (LMICs), which reported that one month of nutritional education among older adults in LMICs is an effective way to increase fruit and vegetable intake²⁰.

Flow of Activities

This community service consisted of a series of activities in four weeks intervention. The first week, data of nutrition knowledge, anthropometry, blood pressure, and dietary intake were examined as baseline data. The second and third week, face-to-face nutrition education was conducted to post-stroke survivors and their families/caregivers to encourage them in healthy diet and lifestyle improvement. The fourth week, we measured the same parameters as baseline to provide endline data. The details as provided in Figure 1 below.

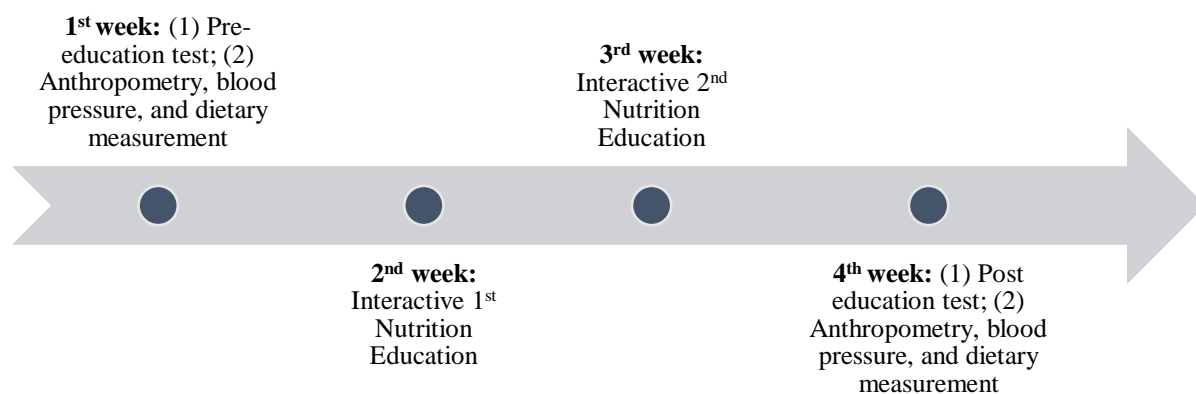


Figure 1. Flow Activity of Nutrition Education Week for Post-stroke Survivors

Pre-education test (Pre-test)

Pre-test was conducted as a preparation step in the 1st week for all subjects. This step aimed to assess the knowledge in post-stroke health management, especially nutrition and body weight, to mapping the material and way of nutrition education process. The test consisted of 10 ‘True’ or ‘False’ statements about recurrent stroke-caused factors, diet recommendation for post-stroke survivors, and health maintenance to prevent recurrent stroke. The details of questions are provided in Table 1 below. All subjects were asked to fill the questions by giving the ‘check’ sign (√) on the ‘True’ or ‘False’ column in the paper-based questionnaire. The questionnaire was adopted from Wardhani et al. (2013) and Nuryanti et al. (2013), which assessed the level of knowledge of stroke and post-stroke patients in Yogyakarta (unpublished thesis).

The survivor who was elderly or difficult to write and read due to cognitive impairment was assisted by our trained nutritionist. The trained nutritionist read the question and let the survivor answer the question. Later, the nutritionist would write the answer in the form. The trained nutritionist monitored this step by walking around to each subject during questionnaire filling process. The monitoring process was carried out to ensure that the questions were answered by subjects, not influenced by their peers or family/caregivers. Each number of questions had ‘1’ point for right answer and ‘0’ point for wrong answer, hence the highest score of pre-tests was 10 and the lowest ones was 0. This pre-test step was then compared with the post-test step to be one of indicators to evaluate the effectiveness of nutrition education process.

Table 1. List of ‘True’ or ‘False’ Statements Related-to Nutrition Knowledge for Post-stroke Survivors.

No	Statement
1	Having hypertension (high blood pressure) history is a risk factor of stroke
2	Doing physical activity or exercise routinely can prevent the risk of stroke
3	Stress is one of risk factors that can trigger stroke
4	Feeding in supine position affect to choke easily in stroke/post-stroke survivors
5	Body weight management is one of prevention ways of stroke/recurrent stroke
6	High consumption of vegetables, fruits, and herbal medicine can prevent stroke/recurrent stroke
7	Restricting or even avoiding processed food can trigger stroke/recurrent stroke
8	Excessive added sugar consumption can increase risk of stroke/recurrent stroke
9	High cholesterol food such as innards, squid, fried food are highly recommended for stroke/post-stroke survivors
10	High consumption of fatty/oily food can increase risk of stroke/recurrent stroke

Anthropometry and Dietary Measurement

There were four measurements, namely anthropometry, blood pressure, physical function, and dietary intake. All those measurements were carried out two times, the first measurement was in the first week of activity (baseline data), while the second measurement was in the fourth week of activity (endline data). Anthropometry measurement included body weight and body height to define body mass index (BMI), mid-upper arm circumference (MUAC) and percent body fat.

Body weight and percent body fat were assessed using Omron Karada Scan bio-electrical impedance analysis (BIA) series HBF-375 body fat and composition monitor. For the survivors who were unable to

measure in standing position (ex. survivors who were in the wheelchair), body weight and percentage body fat were estimated using Omron HBF-306 hand body fat monitor. The accuracy for body weight was 0.1 kg and for total body fat was 0.1%. Prior to the day of measurement, the trained nutritionist announced to the community coordinator to ask survivors to wear the lightest clothes, not wearing jeans, or double outfit. The survivors were then asked to measure body weight and percent body fat two times, with the repetition in the range of 1 minute to stabilize the survivor's physical condition. The result is the average of two measurements.

Body height was measured using stature meter (stadiometer) with 0.1 cm of accuracy. For the survivors who were unable to measure in standing position (ex. Survivor who was in the wheelchair), body height was estimated using formula based on knee length: $56.343 + (2.102 \times \text{knee height in cm})$.²¹ The BMI was then calculated and determined into three categories: (1) underweight (BMI <18.5 kg/m²), (2) normal BMI (18.5 – 24.9 kg/m²), and (3) overweight and obesity (≥ 25.0 kg/m²).²² Meanwhile, percent body fat was classified based on gender, where (1) normal, if percent body fat in male $\leq 20\%$ or female $\leq 31\%$; (2) overfat, if in male $>20\%$ or female $>31\%$; and (3) obesity, if male $>24\%$, while female $>35\%$.²² Survivors who were under fat automatically could not be detected in BIA body fat composition monitor (N/A).

The MUAC was assessed to rapidly detect chronic-energy deficiency (CED). The measurement used MUAC tape which was flexible non-stretch with the accuracy 0.1 cm. The tape laid at the midpoint between the acromion and olecranon processes on the shoulder blade and the ulna, respectively, of the arm of survivor. The survivor was defined as protein-energy wasting (PEW) if the MUAC <23.5 cm and non-PEW if ≥ 23.5 cm. The measurement was conducted with one time repetition in the range of 1 minute. The result is the average of the two measurements.²³

Blood pressure measurement followed the protocol: (1) the survivor was asked to take a seat right after they come for 5-10 minutes; (2) blood pressure was then measured using the OMRON M2 Basic – Digital Automatic Blood Pressure Monitor. The measurement was taken two times, with the repetition in the range of 5 minutes. The result is the average of two measurements. Blood pressure was categorized as hypertension according to the 7th meeting of the Joint Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (the 7th JNC) when systolic blood pressure was ≥ 140 mmHg or diastolic blood pressure (DBP) ≥ 90 mmHg.²⁴

For physical function evaluation, CAMRY EH101 Digital Hand Dynamometer was used and followed the protocol: (1) Hold your arm with your elbow bent at a 90-degree angle; (2) Squeeze the dynamometer as hard as possible; (3) Apply grip force in a smooth motion; (4) Avoid jerking; (5) Repeat one more for a total of two times; (6) The grip strength is the average of the two readings. The result was interpreted as good strength if ≥ 25.0 kg for male and ≥ 17.8 kg for female.²⁵ All these measurements were executed by the trained nutritionist and directly under the supervision of the investigator team.

Dietary intake was estimated using a 24-hour food recall questionnaire to capture the actual food intake of the survivor. Multiple-pass interview was used to record all foods consumed by the survivor during the last 24-hour.²⁶ Food model and food picture book from the Ministry of Health (MoH) of Indonesia 2014 were used to assist the subject recalling food and beverages eaten and ease the trained nutritionist to describe the food or drinks as well as estimate the portions. For survivors who were elderly or unable to remember the consumption of food and drinks on their own, the trained nutritionist asked their families or caregivers.²⁶ Data was then inputted to Nutri-Survey software to estimate macro-nutrients (calories, protein, total fat, and carbohydrate). The database of Nutri-Survey already available, imported from Indonesia food database from the MoH of Indonesia through Indonesia Food Composition Table (IFCT).²⁶ Food database from Singapore, Thailand, and U.S were also imported to cover unavailable food item at the IFCT. Adequacy food intake was defined if intake of each macro-nutrient was 70-100% of daily basis needs. The survivor who has nutrient intake $\geq 110\%$ was classified to excessive, while $<70\%$ was inadequate.²⁶

Interactive 1st and 2nd Nutrition Education

Interactive nutrition education was delivered by an expert speaker, a registered dietitian who was also working as a practitioner at the Dr. Sardjito General Hospital and a resident internist. The education materials were composed of: (1) risk factors and cause of stroke from nutrition perspective, (2) medical nutrition therapy (MNT) for stroke patients, and (3) lifestyle management for post-stroke survivors. All the materials lasted 60 minutes and followed by question and answer or discussion session with survivors and their family/caregiver.

The education process was delivered using wide screen (LED) and each survivor and their family/caregiver obtained a set of leaflets containing (1) a brief explanation of stroke, risk factors, and the progression, (2) MNT for stroke patients, (3) do and don't for stroke and post-stroke survivors, especially on

cooking methods and choosing food/drinks, supplements, and medicine products, and (4) daily meal plan. Real food models were set according to guidance of Indonesia MyPlate or 'Isi Piringku' to describe the example of daily meal plan on what post-stroke survivors should eat for a day as explained by the speaker.



Figure 2. Real Food Model Demonstrated to the Post-stroke Survivors and Their Family

The session was then followed up by nutrition counseling for survivors or family/caregivers who wanted to confirm or solve the problems related to nutrition for stroke. The counseling was a one-on-one session between a registered nutritionist or dietician and survivors or family/caregivers. Each counseling session lasted about 20-30 minutes.

The 2nd nutrition education was executed in the next week and delivered by the same speakers. The aim was to strengthen the subject's understanding about all materials delivered in the 1st education and to motivate the survivors and their family or caregivers to gradually implement what has been suggested by the speakers. The materials were slightly the same as the 1st education, yet the speakers, assisted by the registered nutritionists, approached the survivors and families or caregivers in person (one-on-one) to recall their understanding and give the advice for any problems faced by them. The 2nd education lasted 90 minutes.

Post-education test

Post-test was conducted in the last week (4th week) to evaluate the knowledge and understanding of the subject after two times given nutrition education. The question used in the post-test was the same as pre-test. All subjects were asked to fill the questions by giving the 'check' sign (√) on the 'True' or 'False' column in the paper-based questionnaire. Survivors who were elderly or difficult to write and reading due to cognitive impairment was assisted by trained nutritionist to answer the question. They read the questions per number and let the subjects choose and decide the answer. The trained nutritionist monitored this step by walking around to each subject during questionnaire filling process. The monitoring process was carried out to ensure that the questions were answered by subjects, not influenced by peers or family/caregivers.

Data Management

All data was electronically recorded first in Microsoft 365 (Office) Excel, then was analyzed using SPSS software version 25.0 (Blind). Data were explained and presented as the mean and standard error of the mean for the continuous variables. The paired sample T-test was utilized to examine the differences between baseline data, recorded in the initial week of the intervention, and endline data, obtained in the concluding week of the intervention. A p-value <0.05 was considered statistically significant, and all analyses were done in the two-tailed test.

Ethical Consideration

The ethical approval was granted by the Institutional Review Board (or Ethics Committee) of (Blind) with the protocol code KE/FK/0691/EC/2017. Informed consent was obtained from all post-stroke survivors or their family as well as caregivers before the interview and assessment were carried out. The consent was provided in a paper-based form and used language Bahasa Indonesia. The form explained about: (1) the aim and flow of the community service activity, (2) questionnaire used in the study, (3) measurement as well as assessment and who would be performed, (4) the benefits (both in-kind and in-cash), (5) declaration of confidential assurance, and (6) the side effects as well as the medical treatment if needed. The survivor was asked to read the informed consent or was directly explained by their family/caregivers. Then, they voluntarily decided whether will follow the activity by signing the form as consent. All this process was personally guided by the trained nutritionist.

RESULTS

Demographic of the community was dominated by male (89%) and elderly (82%). Details were explained in Table 2. Nutrition profile of the community both in pre- and post-nutrition education was majorly overweight and obesity (> 80%) with total body fat was high (> 20 – 24.9%) and very high (25% and above). Handgrip strength of the survivor was mostly also poor, in which < 20 kg for female and < 30 kg for male with prevalence \geq 70%. The nutrition profile data was provided in Supplementary file 1.

Table 2. Characteristics of Post-stroke Survivors (n=27)

Variable	n (%) or mean \pm SD
Gender, n (%)	
Male	24 (88.9)
Female	3 (11.1)
Age, n (%)	
Adult (< 60.0 years)	5 (18.5)
Elderly (\geq 60.0 years)	22 (81.5)
Education level, n (%)	
Middle school	4 (14.8)
High school	21 (77.8)
University	2 (7.4)
Diseases history, n (%)	
No diseases history	14 (51.9)
Cardiovascular	1 (3.7)
Stroke	5 (18.5)
Complication	7 (25.9)
Smoking history¹, n (%)	
Yes	4 (14.8)
No	23 (85.2)
Stroke period (years), (mean \pm SD)	7.0 \pm 4.3

¹ Smoking history 'no' means respondent never or had been to stop smoking.

Interactive nutrition education affected the changes of nutritional status of the survivor and nutritional knowledge scored both survivors and family/caregivers. Body weight, BMI, HGS, energy intake, and nutritional knowledge score of the survivor and family/caregivers significantly increased from baseline (pre-nutrition education) to endline (post-nutrition education). However, there was no significant improvement on MUAC, body fat total, protein, fat, and carbohydrate intake among survivors. See the details in **Table 3**.

Table 3. Mean Difference of Nutrition Profile, Nutrient Intake, and Score of Nutrition Knowledge (n=27)

Nutritional Profile and Nutrient Intake	Nutrition knowledge (baseline) (mean \pm SE)	Nutrition knowledge (endline) (mean \pm SE)	Δ of change	p-value ¹
Body weight (kg)	67.8 \pm 1.9	68.6 \pm 1.9	0.8	<0.001
Body mass index (BMI, kg/m ²)	29.5 \pm 0.8	29.8 \pm 0.7	0.3	<0.001
Mid upper arm circumference (MUAC, cm)	30.1 \pm 0.6	29.6 \pm 0.7	-0.5	0.069
Body fat total (%)	26.4 \pm 0.9	26.2 \pm 0.9	-0.2	0.581
Handgrip strength (HGS, kg)	26.1 \pm 2.0	26.8 \pm 2.0	0.7	<0.001
Energy intake (kcal/day)	1334.5 \pm 75.7	1389.1 \pm 95.0	54.6	0.008
Protein intake (grams/day)	48.4 \pm 3.4	53.1 \pm 3.6	4.7	0.133
Fat intake (grams/day)	45.0 \pm 3.1	44.6 \pm 4.1	-0.4	0.918
Carbohydrate intake (grams/day)	189.9 \pm 13.0	213.8 \pm 15.3	23.9	0.062
Knowledge score of subjects (points)	6.5 \pm 0.6	7.0 \pm 0.6	0.5	<0.001
Knowledge score of caregivers (points)	8.8 \pm 0.3	9.3 \pm 0.3	0.5	0.002

¹ p-value was significant at the level of < 0.05 by Paired t-test.

DISCUSSION

This study highlights that nutrition education might potentially improve nutrition knowledge both in post-stroke survivors and their family/caregivers. Additionally, there was improvement in body weight, nutritional status, physical function, and intake of calories after two series of nutrition education. The findings are useful mainly for health workers, patients, family as well as caregivers to provide optimal care for post-stroke survivors. This should be recognized that several recommendations are essential to be implemented to the post-stroke survivors as well as to achieve better nutritional outcomes and to prevent recurrent stroke.

This finding, which revealed that nutrition education improved intake of calories, was relevant to a previous study. A previous study highlighted that proper knowledge and skill in preparing food manifested to a positive impact on dietary well-being and potential improvement in the health-related quality of life, involving the process of swallowing and nutritional status for stroke survivors.²⁷ As the recommendation, post-stroke survivors and their family/caregivers, especially with dysphagia should receive adequate knowledge and hands-on food preparation training to elevating food intake and achieving dietary well-being.²⁷ Exposure of knowledge and hands-on training related to nutrition care as well as daily meal plan, diet monitoring, food preparation and cooking improved on food intake and dietary well-being in stroke survivors, compared to the survivors who did not receive kinds of interventions.²⁷ In general, focusing on family support in nutrition care, there was good evidence of repeated education and counselling, hands-on training, and home-care visits on the health improvement of post-stroke survivors.

Following the increment of 0.8 kg body weight, the average BMI also elevated and placed into the overweight category. A cross-sectional study involving 1,753 post-stroke survivors in China revealed that over 50% were classified as over-nourished, including both overweight and obese individuals.²⁸ Many of prior studies explained on “obesity paradox”, in which stroke patients or post-stroke survivors who have a BMI of $>25 \text{ kg/m}^2$ have a better prognosis regarding clinical outcome in those cardiovascular diseases and have a lower risk of mortality than non-obese,^{29,30} However, the study reported that among middle adults (40-65 years), obese patients experienced a 1.5-fold higher incidence of cognitive impairment three months after the stroke compared to their non-obese counterparts, while the association was not found in the older adult (≥ 65 years).²⁸ Additionally, the underweight patients/survivors had higher risk of mortality at an average of 1.5 years follow-up.²⁹ A prior study found that underweight acute stroke patients were more likely to have higher risk of chronic infections or malignant tumors explaining the poor prognosis.³⁰ These findings highlight the need for tailored personal post-stroke nutrition management strategies to optimize body weight and health outcomes.^{28,30}

The transition from acute to post-stroke phase is a significant challenge for stroke survivors and their family due to recovery phase after stroke is the key to determine quality of the survivors' life. Tailored information and resources related to practical knowledge, skills, and tools for post-stroke nutrition treatment are essential to empower the family in fostering the survivors.^{31,32} Early assistance or guidance from health workers, as well as periodic education and counselling through many ways could have an important role for survivor and family to support them and increase their satisfaction, reduce depression, and promote independence in daily living activities.¹⁴

In our study, the increase in knowledge scores among post-stroke survivors and their families/caregivers could be influenced by factors such as peers and family support, self-efficacy, and behavioral intent. Previous studies have supported this argument. A meta-analysis indicated that nutritional interventions successfully improve the intake of vegetables, fiber, and fruit.¹⁹ Conversely, a pilot study revealed that increased knowledge about diet, exercise, nutrition, and physical activity did not correlate with healthier behaviors, greater self-confidence, stronger behavioral intentions, or a more advanced stage of change among acute stroke patient.³³ However, self-efficacy showed a significant positive correlation with higher combined behavior scores. This suggests that most participants were at least contemplating making healthy lifestyle changes.³³ A frequently mentioned obstacle to change was a lack of knowledge.^{19,33}

Since the beginning of the 21st century, numerous nutrition researchers have emphasized the importance of theory-based research for testing and evaluating effective strategies to help individuals modify their dietary behavior to be healthier as recommended.³⁴ The researchers stated that nutrition interventions that are developed with a solid theoretical foundation may be more effective than those that lack such a basis.³⁴ A systematic review, focused on trends of behavioral theory-based used by dietician/nutritionist to improve patient's quality of life, found that the most used theory is theory of planned behavior.³⁴ The theory indicates

that in addition to subjective norms and attitudes toward the behavior, behavioral intention depends on an individual's perceived control (self-efficacy) over opportunities and resources, as well as the skills required to perform the behavior [35]. The Theory of Planned Behavior predicts that the likelihood of behavioral change is directly dependent on individuals' self-efficacy and their control over their behavioral intent.^{34,35}

Therefore, when establishing a stroke education campaign, it is important to consider that individuals are more likely to change their behavior if (a) they believe it will result in health benefits (e.g., reducing negative stroke outcomes by seeking early help); (b) they have the approval of others (e.g., their spouse supports contacting emergency services when stroke symptoms are suspected); (c) they possess the necessary skills (such as the ability to identify key stroke symptoms); and (d) the required resources are available (such as accessible emergency services).^{33,35} In conclusion, to attain the behavior changes among post-stroke survivors and their families/caregivers, it is necessary to design a series of educational or counselling sessions that can motivate them to be more aware and having an intention to changes.^{33,24,25}

CONCLUSIONS

There was an improvement in nutrition knowledge related to post-stroke nutrition management. In sequence, there was an enhancement of intake of calories and nutritional status, indicated by the increase of body weight, BMI, and HGS among post-stroke survivors. Future sustainable research is encouraged to support the family as well as to maintain the knowledge to take care of the survivors. Moreover, future nutrition intervention such as the use of education toolkit is essential to equip the family with more advanced skills and best practice on applying nutrition management for post-stroke survivors.

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CONFLICT OF INTEREST AND FUNDING DISCLOSURE

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