Frailty as a Key Predictor of Malnutrition among Older Adults with Swallowing Problems

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Abstract: Geriatric syndrome—frailty—has a more significant influence on the health of older, pre-frail and frail older adults who tend to have a poor nutritional status or develop severe malnutrition. Investigation of frailty and its association with malnutrition and swallowing problems is limited in older Thais. This cross-sectional study examined the association among frailty and other associated factors with malnutrition in older adults with swallowing problems. A purposive sampling method was employed to recruit 120 participants who met the specified inclusion criteria. Data were obtained from older adults who visited and received medical services at the rehabilitation department of a university hospital in Bangkok, Thailand, from July 2022 to February 2023. The instruments included the Demographic and Health Information Record Form, Mini Nutritional Assessment Short-Form - MNA® Elderly, Reported Edmonton Frail Scale-Thai Version, and Modified Barthel Activities of Daily Living Index. Data were analyzed using descriptive statistics and multiple logistic regression.

The findings indicated that 82.5% of participants were frail, and approximately 30% and 80.0% presented with dependence and at-risk or malnutrition, respectively. Frailty, age, comorbidities, a history of aspiration, and activities of daily living could predict malnutrition, accounting for 71.7%. Significantly, frailty demonstrated a 4.47-fold increased risk of malnutrition, while dependence on activities of daily living had a 6.41-fold increased risk of malnutrition among this population. The findings of this study provide valuable insights for healthcare professionals, especially gerontological nurse practitioners, to raise awareness of the early detection of frailty, swallowing problems, and potential risks of malnutrition, together with promoting daily activity in older adults across settings. Implementing comprehensive management to improve swallowing and physical function in older adults at risk of frailty and malnutrition may enable gerontological nurse practitioners to strengthen professional care. By doing so, maintaining nutritional health among these populations can be achieved.

Keywords: Activities of daily living, Frailty, Malnutrition, Older adults, Swallowing problems

Received 4 January 2024; Revised 23 January 2024; Accepted 27 January 2024

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Introduction

In aging populations, swallowing problems or swallowing difficulties known as dysphagia is an often overlooked health issue, and clinical presentation of these may be difficult to detect. Furthermore, individuals with undiagnosed dysphagia may endure the condition and potentially experience silent aspiration.[1] Recently,

https://doi.org/10.60099/prijnr.2024.267113

evidence emphasized that once an older person experiences swallowing problems, the up-surging consequences develop—poor health outcomes, malnutrition, dehydration, pneumonia, shortened life span, poor quality of life, and long-term consequences by increasing the burden on caregivers.[1, 2] Therefore, understanding the impact of dysphagia on health in the older population is essential for health professionals. This understanding enables them to deliver enhanced care and proactively prevent adverse health outcomes.

Among the sequels of swallowing problems, malnutrition is a significant problem that negatively impacts the quality of life and can increase the risk of delirium, prolonged hospitalization, and mortality in hospitalized older adults.[3] Therefore, preventing the impact of malnutrition due to dysphagia is of concern in improving care and mitigating its effects. Evidence demonstrated that personal and health factors, such as age, comorbidity, aspiration history, and decreased physical ability, are significant contributing factors to malnutrition in older adults with dysphagia.[4, 5] Although considerable research has been conducted on these factors related to malnutrition in older adults with difficulty swallowing, the influence of geriatric syndrome on this population has received relatively little attention. Frailty—a new geriatric syndrome—has become an interest since it influences the health of older adults. Several studies have shown that frailty is associated with in-hospital, post-discharge care needs, postoperative complications, postoperative delirium, and prolonged length of hospital stay in hospitalized older people.[6,7] In addition, a previous study has demonstrated that pre-frail and frail older adults tend to have poor nutritional status or develop severe malnutrition.[8] However, malnutrition due to difficulty swallowing is a significant clinical problem often overlooked among older people. Remarkably, there has been limited published investigation of frailty and its association with malnutrition in older adults with swallowing problems. Thus, exploring the association between frailty and malnutrition in older adults with difficulty swallowing is necessary for preventing adverse consequences in the aging population.

As mentioned previously, evidence indicates that difficulty swallowing in older adults is complex, necessitating effective management to prevent adverse outcomes and improve the quality of life. Efficiently managing malnutrition-related factors is more challenging for professional healthcare and gerontological nurse practitioners to promote health. To give proper care, it is essential to understand the relationship among factors that influence malnutrition concerning age-related decline involvement in this population. However, research has not yet determined factors—personal/health and frailty—associated with malnutrition in older adults with difficulty swallowing, particularly in the Thai context. The information obtained in this study would be essential for health personnel in planning care to promote health and nutrition, prevent malnutrition, and enhance the quality of life for this population.

Literature Review

Due to the rapid growth of the aging population, dysphagia tends to have a higher chance of occurrence and a more complicated symptom due to degenerative factors or the aging process. Evidence emphasizes that once an older adult experiences dysphagia, the up-surging consequences develop—poor health outcomes, malnutrition, dehydration, pneumonia, shortened life span, poor quality of life, and long-term consequences by increasing the burden on caregivers.[1, 2] As dysphagia is more prevalent in older adults, a previous study has explored the relationship between age and aging processes affecting swallowing; the findings indicated that the risks of developing dysphagia are mostly associated with degenerative conditions or aging processes.[9] Therefore, the medical term presbyphagia is used for age-related alterations in the anatomy and physiology of the head and neck.[9] Moreover, other age-related declines in decreasing muscle mass or sarcopenia lead to changes in oral cavity structure and

swallowing function, particularly in the oral, pharyngeal, and esophageal stages of the swallowing process. As dysfunction in any stage of the swallowing process intensifies, the movement of food or water becomes increasingly challenging, leading to unsafe swallowing in older adults.[9] As people age, the flexibility of the muscles and saliva production decline, resulting in less effective swallowing and increasing the risk and severity of dysphagia. Moreover, dysphagia may increase more severe complications in vulnerable older adults or those who need complex care. Evidence underlines that older adults with multiple comorbidities are more likely to develop dysphagia than the average aging population.[10]

The prevalence and severity of difficulty swallowing vary depending on health conditions. Suffering from dysphagia was identified in more than 60% of several medical conditions, including Parkinson's disease, stroke, head and neck cancer, or neurodegenerative diseases[1]. Remarkably, the highest prevalence of dysphagia was found in older adults with dementia, reaching 91%.[11] Interestingly, initial evidence suggests that dysphagia may predominantly impact personal health by involving neuro-muscular degeneration more than other factors. In older adults with chronic or neurodegenerative diseases, the impairment of swallowing control from the mouth, throat, and esophagus gradually develops; then, the risk of dysphagia is relatively increasing, resulting in diminished nutrient intake and, thereby, increased likelihood of malnutrition.[12] Recent findings emphasized that dysphagia is linked not only to age-related physiological changes but is also associated with complications such as aspiration-induced pneumonia, increased morbidity and mortality. Additionally, it poses a heightened risk of malnutrition.[13]

Dysphagia-induced malnutrition represents a substantial challenge, detrimentally affecting the quality of life in older adults to a greater extent than previously anticipated and elevating the risk of mortality.[13] Evidence has revealed that malnutrition in older adults is associated with increased adverse health outcomes, such as an increased chance of mortality and prolonged hospitalization.[14] Moreover, malnutrition also increases the risk of developing depression and anxiety, which eventually decreases the quality of life in older adults with dysphagia.[13] Therefore, addressing malnutrition involves restoring proper nutrition and requires a comprehensive approach that considers the psychological and social aspects of an individual's well-being. Exploring risk factors associated with dysphagia has become prevalent to improve care and mitigate its effects. Evidence demonstrates that personal and health factors, such as age, comorbidity, aspiration history, and decreased physical ability or activities of daily living dependence, are significant contributing factors to malnutrition in older adults with dysphagia.[4,5] Moreover, clinical presentation, particularly coughing when eating or drinking, is a predictive factor for malnutrition in older adults with dysphagia.[5] Impairment in the oral cavity and swallowing function—reduction in muscle mass and strength in chewing and swallowing—also increased the risk of reducing nutritional intake and increased malnutrition severity.[15] Undeniably, older adults with difficulty swallowing have more suffering than those without this condition. Also, results from a meta-analysis in 12 cohort studies indicated the relationship between dysphagia and the risk of frailty and pre-frailty.[16] While substantial research has been conducted on factors associated with malnutrition in older adults with difficulty swallowing, the influence of geriatric syndrome on this population has received relatively little attention.

Current evidence indicates that geriatric syndrome—frailty, which refers to the clinical conditions associated with age-related decline in multiple body systems, gradual loss of body reserves and the ability to respond to stressors or stimuli, leading to reduced function and health in older individuals[17]—has a greater influence on the health of older adults, leading to modest to life-threatening unfavorable outcomes.[7] Frailty causes swallowing difficulty and inefficiency, leading to more complex management in older adults with both

frailty and dysphagia; hence, having frailty and dysphagia together is more likely to increase inadequate nutrients, resulting in even more malnutrition.[18] Several studies have demonstrated that pre-frail and frail older adults tend to have poor nutritional status or develop severe malnutrition.[8] However, malnutrition due to difficulty swallowing is a significant clinical problem often overlooked among hospitalized and community-dwelling older adults.

In Thailand, few studies have explored the prevalence of swallowing problems, including dysphagia, with findings indicating that approximately 11% of community-dwelling Thai older adults develop swallowing problems;[19] and 15% of dysphagia prevalence was identified in hospitalized older adults, particularly people with post-stroke rehabilitation.[20] Remarkably, there has been no published investigation of frailty and its association with malnutrition in older adults with swallowing problems. Thus, exploring the association between frailty, together with other personal health factors and malnutrition in older adults with difficulty swallowing, is necessary for preventing adverse consequences in an aging population.

Study Aim

The study aimed to determine whether frailty, age, comorbidities, history of aspiration, and activities of daily living would be associated with malnutrition in older adults with swallowing problems.

Methods

Design: This study utilized a cross-sectional analytical design and is presented by the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines checklist for observational studies.

Sample and Setting: The population in this study was older adults aged 60 years and over who visited and received services at the outpatient rehabilitation department and/or the rehabilitation ward at Ramathibodi Hospital, Mahidol University, Bangkok, from July 2022 to February 2023. A purposive sampling method was used to recruit participants based on the following inclusion criteria: male and female aged 60 years and older, having swallowing problems as determined by the Eating Assessment Tool (EAT-10), having no cognitive impairment evaluated by the Six-item Cognitive Impairment Test (6CIT), and being able to comprehend the Thai language. Individuals who were bedridden or had oral consumption restrictions, such as those with nasopharyngeal feeding tubes, were excluded from the study.

The sample size was determined using the Burmeister and Aiten[21] recommendation for determining the appropriate sample size for logistic regression analysis; a proper approach for determining the sample size is at least 20 persons per one variable. Six variables were utilized to determine the sample size; therefore, 120 participants were required.

Ethical considerations: Following approval from the Institutional Review Board (IRB)—the Human Research Committee from the Faculty of Medicine, Ramathibodi Hospital, Mahidol University (ID # MURA 2022/247), the data collection process was initiated. Potential participants were approached, and the study objectives, associated risks, benefits, and procedures were clearly explained. They were encouraged to ask questions and retained the right to decide whether to participate or refuse to participate in the study willingly. Their decision would not impact the benefits or medical treatments they might receive from the hospital service. They also were assured that all participants' information was kept confidential in a secured location, accessible only to the research team. Data were presented in aggregate form without disclosing any individual information for academic purposes, and in compliance with IRB regulations, the data would be subsequently destroyed.

Instruments: The instruments used in this research included tools for screening and data collection.

The 6-item Cognitive Impairment Test (6CIT) Thai version was used to screen cognitive impairment, particularly in the older population. The 6CIT was first developed by Brooke and Bullock[22] and was translated into Thai by Aree-Ue and colleagues.[23] The 6CIT consists of three components: 1) surrounding circumstance perception (3 items), 2) attention (2 items), and 3) memory (1 item). Each item is scored differently, ranging from 0 to 10. The total score ranges from 0 to 28 points, with a score exceeding 7 indicating an elevated risk of developing cognitive impairment. After translation into the Thai language, the 6CIT was tested for its reliability and validity; the content validity index for scales (S-CVI) and item validity context (I-CVI) of 1 were reported as good validity. The congruent validity compared with the standard instrument—the Mini-Cog test—was acceptable (r_s = -.42, p <.001). Also, the test-retest reliability showed stability reliability with a significant strong positive correlation between two weeks.[23]

The Eating Assessment Tool 10 (EAT-10) was used to screen swallowing problems. Originally developed, and later translated into Thai, by Nestlé Research Center in Switzerland in 2008.[24] The EAT-10 contains ten questions (i.e., "swallowing problems caused weight loss," "exerting more than usual effort to swallow liquids," and "coughing when eating"). Each question had the 4-option with a score ranging from 0 (no problem) to 4 (severe problem). The total score ranges from 0 to 40; a score of 3 or more indicates a swallowing problem. The original English version of the EAT-10 tested for reliability in hospitalized patients; test-retest reliability showed a high correlation coefficient (r = 0.71-0.91).[24]

The research team developed a *Personal and Health Data Questionnaire* from a literature review to obtain personal and health information of older participants. The questionnaire consisted of questions, i.e., age, sex, marital status, education level, weight, height, comorbidities, history of eating difficulties, physical activity, and rehabilitation information. The questions are open-ended and categorized.

The Mini Nutritional Assessment Short-Form (MNA-SF) - MNA® Elderly was used to assess the nutritional status of participants in this study. This assessment was first developed by the Nestlé Research Center in Switzerland in 1990. Later, it was modified to be more appropriate and comprehensive in assessing the nutritional status of older adults.[25] The MNA-SF was translated into Thai by the Nutrition Research Institute at Mahidol University.[26] The MNA-SF consists of 2 parts; the first contains six questions on decreased food intake, weight loss, and having acute stress or illness. Each question rated scores differently. A total score ranges from 0 to 14, classified as 0-7, which indicates malnourishment; 8-11, which suggests having a risk of malnutrition; and 12-14, which indicates normal nutritional status. If a participant's score is less than or equal to 11 points, section 2 would be used to determine nutritional status.

The second section comprises 12 questions designed to evaluate nutritional status. Example questions relate to self-help, the number of food types eaten, vegetables or fruits, arm circumference, and calf circumference. The total score for this part is 16. To determine nutritional status, the score from part 1 is combined with the score of part 2 with a total of 30; the nutritional status was classified as malnourish (scores less than 17), risk of malnutrition (scores 17-23.5), and normal nutrition (scores 24-30). In this study, the MNA-SF score would be classified into two categories—a binary variable— as normal (24 or higher) and malnutrition status (less than 24) for final analysis. The MNA-SF was verified for its valid nutritional screening tool with a good sensitivity.[25]

The Reported Edmonton Frail Scale-Thai version (REFS-Thai) was used to assess the frailty status. The original version of REFS was developed by Hilmer and colleagues,[27] and later translated into Thai.[28] The REFS-Thai consisted of 9 questions, i.e., general health, dependence, urinary incontinence,

and drug use. Each question ranges from 0 (no problem) to 2 (having a problem). A total score ranges from 0 to 18, which was categorized as no frailty or robust (scores 0-5), pre-frailty or apparently vulnerable (score 6-7), mild frailty (score 8-9), moderate frailty (score 10-11), and severe frailty (score 12-18). The REFS-Thai version was tested for validity and reliability in hospitalized older adults. The item-level content validity index (I-CVI) and scale-level content validity index (using the universal agreement method)—S-CVI/UA—were 0.97 and 0.92, respectively. The reliability reported by Cronbach's alpha coefficient was 0.728, and the test-retest reliability showed an unweighted kappa of 0.78 and a weighted kappa of 0.87.[28]

The Modified Barthel Activities of Daily Living Index (MBAL)-Thai version was used to assess an individual's ability to perform activities of daily living (ADL). Mahoney and Barthel first developed this assessment, which was first translated and modified into Thai by Jitapunkul.[29] The BAL index consisted of ten daily activities: self-transportation, walking, using the toilet, washing the face, urinating, defecating, bathing, eating, putting on clothes, and walking downstairs. Each activity is scored ranging from 0 (unable to perform a daily activity) to 2 (able to perform a daily activity by oneself). A total score ranges from 0 to 20 and is classified as total dependency (score 0-4), severe dependence (score 5-8), moderately severe dependence (score 9- 11), and mild dependence (score 12 or higher). The MBAL Index-Thai version was reported its reliability with Cronbach's alpha coefficient of .87.[30]

Data Collection: Data was collected from July 2022 to February 2023 after the primary investigator (PI) utilized electronic medical records (EMRs) to screen potential participants, ensuring they met the primary inclusion criteria. After obtaining study consent and screening for cognitive impairment and swallowing problems, a structured face-to-face or telephone interview started. Since data collection occurred during the COVID-19 pandemic, the researcher conscientiously followed the hospital's COVID-19 preventive measures policy. This involved adhering to screening protocols and maintaining social distancing during face-to-face interviews, which lasted less than 5-10 minutes.

Data Analysis: This was performed by using licensed software for statistical analysis—Statistical Package for the Social Sciences (SPSS) version 21 and RStudio version 4.3.1 MacOS. Descriptive statistics—frequency, percent, mean, and standard deviation—were performed to analyze personal and health factors, frailty score, nutrition score, and the prevalence of frailty and malnutrition in older adults with swallowing problems. Multiple logistic regression was performed to analyze the relationship between personal and health factors, frailty, and nutritional status in older adults with swallowing problems. The bootstrap of 1,000 was employed by re-sampling from an existing small sample of a single data set to assess statistical accuracy. The level of significance was set at.05.

Results

One hundred forty eligible participants were approached and 20 were excluded due to cognitive impairment. Thus, the final participants totaled 120 with an average age of 72.53 years (SD = 8.102, range 60-96 years) and most (59.2%) were female. Based on the body mass index (BMI) classification for Asians, nearly half of the participants were classified as normal weight (42.5%). The top three health conditions were hypertension (65.8%), dyslipidemia (55.8%), and diabetes mellitus (34.2%), respectively. As per eating problems during mealtimes, most participants reported swallowing problems (100.0%), followed by aspiration (72.5%). Furthermore, a substantial proportion of participants used gait aids (61.7%), and the majority underwent physical and occupational therapy for rehabilitation (88.3%). The participants' characteristics and health information details are illustrated in **Table 1.**

Table 1. Participants' personal characteristics and health information (N = 120)

Variables	n (%)	Variables	n (%)
Gender		Occupation	
Male	49 (40.80)	Currently work	9 (7.5)
Female	71 (59.20)	Retirement	111 (92.5)
Age (years) (range = 60-96, M±SD = 72.53±8.10 years)		Marital status	
60-69	50 (41.67)	Single	15 (12.5)
70-79	45 (37.50)	Divorced/Widowed	17 (15.1)
≥ 80	25 (20.83)	Couple	88 (73.4)
Education level		Living arrangements	
Informal education	4 (3.3)	Alone	3 (2.5)
Primary level	40 (33.3)	Living with others	12 (10.0)
Secondary/Diploma	27 (22.5)	Living with their children	47 (39.2)
Bachelor and higher	49 (40.8)	Living with spouse	58 (48.3)
Body Mass Index (kg/m^2) (Range 13.75-40.18,		Underlying diseases/Comorbidity*	
M ± SD = 23.59 ± 4.13)		Hypertension	79 (65.8)
18.5 (Underweight)	6 (5.0)	Dyslipidemia	67 (55.8)
18.5-22.9 (Normal)	51 (42.50)	Diabetes mellitus	41 (34.2)
23.0-24.9 (Overweight)	27 (22.50)	Stroke	40 (33.3)
25.0-29.9 (Obesity class I)	28 (23.30)	Cardiovascular disease	37 (30.8)
≥30.0 (Obesity class II)	8 (6.70)	Osteoarthritis	20 (16.7)
Eating problems during meal time*		Others (i.e., cancer, cataract)	95 (79.1)
Loss of appetite	7 (5.8)	Number of comorbidities	
Aspiration	87 (72.5)	< 3 diseases	23 (19.2)
Swallowing problems	120 (100.0)	≥ 3 diseases	97 (80.8)
Walking aids		Required rehabilitation	
No gait aid use	46 (38.3)	Required without specific types	14 (11.7)
Gait aid use	74 (61.7)	Required physical & occupational therapy	106 (88.3)

* More than one answer

Most participants were frail; the prevalence of frailty, dependence in activities of daily living, and at-risk or malnutrition was 82.5%, approximately 30% and 80.0%, respectively (**Table 2**). **Table 3** demonstrates the association among interest variables on nutritional status in older adults with swallowing problems investigated by Spearman's rank correlation coefficient, revealing that the predictors—activities of daily living and frailty—were significantly related to malnutrition.

Table 2. Percentage, mean, and standard deviation of frailty, activities of daily living, and nutritional status among older adults with swallowing problems (N = 120)

Variables	n (%)	Possible range	Actual range	Mean ± SD
Frailty (total scores)		0-17	1-15	9.00 ± 3.29
Not frail	21 (17.5)	0-5	1-5	3.76 ± 1.38
Pre-frailty (Apparently vulnerable)	17 (14.2)	6-7	6-7	6.41 ± 0.49
Mild frailty	19 (15.8)	8-9	8-9	8.37 ± 0.48
Moderate frailty	31 (25.8)	10-11	10-11	10.53 ± 0.50
Severe frailty	32 (26.7)	12-17	12-15	12.64 ± 0.88

Table 2. Percentage, mean, and standard deviation of frailty, activities of daily living, and nutritional status among older adults with swallowing problems (N = 120) (Cont.)

Variables	n (%)	Possible range	Actual range	Mean ± SD
Activity of Daily Living (total score)		0-20	2-20	14.04 ± 5.52
Total dependence	12(10)	0-4	2-4	3.27 ± 0.86
Severe dependence	12(10)	5-8	5-8	5.54 ± 1.23
Moderately dependence	12(10)	9-11	9-11	10.50 ± 0.65
Independence	84(70)	12-20	12-20	17.18 ± 2.52
Nutrition status (total score)		0-30	10.5-28	21.11 ± 3.97
Malnutrition	17(14.2)	0-16.5	10.5-16.5	14.29 ± 1.96
Risk for malnutrition	71(59.2)	17-23.5	17-23.5	20.68 ± 2.02
Normal nutrition	32(26.7)	24-30	24-30	25.69 ± 1.26

Table 3. The correlation among variables of interest and nutritional status in older adults with swallowing problems (N = 120)

Variables	1	2	3	4	5	6
1. Age[a]	1.000					
2. Number of comorbidities	.063	1.000				
3. Aspiration	.017	.255**	1.000			
4. ADL status	.075	.158	.118	1.000		
5. Frailty status	.166	.200*	.276**	.437**	1.000	
6. Nutrition status	-.039	.015	.124	.441**	.413**	1.000

Note. * p < 0.05, ** p < 0.01, 2-tailed; ADL = activities of daily living; [a]assessed by Pearson correlation coefficient

Specifying the predictive model, the multiple logistic regression model explained 34.6% (Nagelkerke R^2) of the variance in the nutritional status of older adults with swallowing problems and correctly classified 71.7% of cases. Frailty and dependency on daily activities significantly predicted malnutrition status in this population (p < .05). The frail participants were more likely to develop malnutrition when compared with those without frailty status (OR = 4.47, 95% CI = 1.57-12.76, p = .004). For the activities of daily living, dependent participants had an increased risk of developing malnutrition compared with those without dependency status (OR = 6.41, 95%CI = 2.08-19.74, p = .002). The details are shown in **Table 4.**

Table 4. Multiple logistic regression analysis of frailty and other factors on malnutrition in older adults with swallowing problems (N = 120, Bootstrapping = 1,000)

Variables	Crude ORs	95% CI	*p*-value	Adjusted ORs[b]	95% CI	*p*-value
Age	0.990	.947-1.035	.667	.965	.914-.1.017	.174
Comorbidities ≥ 3	1.142	.614-2.126	.167	.705	.327-1.521	.402
Aspiration	1.750	.779-3.934	.176	1.213	.437-3.367	.718
ADL dependency	1.616	1.352-1.931	.03	6.414	2.083-19.749	.002
Frailty	7.121	2.880-17.608	.001	4.477	1.570-12.764	.004

[b] -2Log likelihood = 129.997; Cox & Snell R^2 = .260; Nagelkerke R^2 = .346

Chi-square = 36.058, df = 5, p <.001; Hosmer and Lemeshow test: p > .05

Classification accuracy = 71.7%

Abbreviation: ORs = Odds ratio; CI= Confidence interval

Discussion

Results from this study showed that more than 80% of participants had frailty, which was classified into severe frailty (26.70%), moderate (25.80%), mild (15.80%), and pre-frail (14.20%). Our results are consistent with prior studies, although the prevalence varied depending on geographic areas. Frailty was found to have a higher prevalence of 76% in older adults living in residential aged care,[31] and 24.4% in hospitalized older adults[32] with different stages of frailty. In addition, frailty is more commonly found in older adults with swallowing problems or dysphagia than other factors without these conditions.[32,33] The developed frailty may be attributed to age-related declines in decreasing muscle mass, including oral cavity structure and swallowing function,[9] leading to older participants at risk for malnutrition—80% in this study. Evidence from a previous study indicated that a high prevalence of frailty was found, and nearly half were frail and malnourished.[31] In addition, comorbidity (i.e., stroke), support for walking needs, and advancing age were associated with frailty and malnutrition;[32] older participants in this study had an average age older than 70 years, had comorbidity (100%), and required walking aids.

Regarding the discrepancies in the prevalence of frailty, as mentioned, our study was conducted in older adults with swallowing difficulties and found a high prevalence of frailty (82.5%). We utilized the REFS-Thai version, based on the concept of the accumulation deficit model.[28] However, those prior studies evaluated frailty based on Fried's frailty phenotype, measuring frailty included the five specific phenotypes of frailty: 1) unintentional weight loss, 2) weakness, 3) exhaustion, 4) slow gait speed, and 5) low physical activity.[17] Moreover, other assessment tools were employed to measure frailty; the differences in frailty tools used and different concepts may lead to the varied prevalence of frailty. Nonetheless, it is crucial to identify frailty by comparing various instruments to enhance care and promote the health and well-being of the older population.

Regarding nutritional status among older adults with swallowing difficulties, our findings revealed that most of the participants were at risk for malnutrition, and 14.2% of them were malnourished. Evidence from other studies showed that nutritional status varies across countries. For example, among older individuals in Nepal, the prevalence of malnutrition and those at risk of malnutrition were determined to be 11.6% and 49.7%, respectively.[34] Additionally, a reported prevalence of malnutrition or being at risk for malnutrition was 71.6% among older Vietnamese patients with dysphagia.[35] The disparity in nutritional status across countries may be influenced by factors such as eating problems, health conditions, poor socioeconomic status, and living and marital status, including living alone or being unmarried, widowed, or divorced.[36]

Regarding factors associated with malnutrition, frailty and the ability to perform daily activities were significantly associated with malnutrition in older adults with swallowing problems. Our findings align with prior studies regarding the association between frailty and malnutrition.[33,37] According to a meta-analysis exploring frailty, sarcopenia, and malnutrition in 47 studies, 11 studies discovered that older adults experienced frailty. In comparison, ten studies found that frailty was associated with an increased risk of malnutrition of 5.77 times.[37] The association between frailty and malnutrition can be explained that frailty triggers age-associated deterioration of functions, which leads to an imbalance in the homeostasis of physiological systems in the body, presenting specific clinical presentations as decreased muscle strength, slow movement, fatigue, low physical activity, and unintentional weight loss.[33] Undeniably, frailty is closely related to malnutrition as the causes of malnutrition include loss of appetite and muscles, weakness, fatigue, and decreased energy consumption.[33] Also, older participants in this study had an average age of more than 70 years and had swallowing problems. Due to age related-decline, aging alters the way of digesting food, absorbing nutrients, and metabolizing energy; these changes, in

conjunction with oral intake ability restriction—and swallowing problems—lead to frailty and at-risk for malnutrition.[38]

Regarding the ability to perform daily activities, our study revealed a wide range of physical impairments, from severe dependence to independence, in older adults with swallowing problems. Moreover, the present study's findings shed light on the needs of care in this population since approximately 30% of the participants required supportive care due to their dependency on performing simple activities of daily living. Furthermore, when compared to those who were independent, individuals with more severe dependency demonstrated a higher risk of developing malnutrition. Notably, a recent study conducted on community-dwelling older adults showed that activities of daily living, along with dependence on performing activities of daily living, were significantly associated with malnutrition.[39] Moreover, older participants in this study had swallowing problems. Older people with swallowing problems—dysphagia—were more likely to develop activities of daily living dependence, reduced nutritional intake, and dietary pattern,[2,40] eventually leading to malnutrition.

The findings of this present study revealed favorable associations between frailty and activities of daily living dependent on malnutrition in older adults with swallowing problems, age, aspiration history, and comorbidities. However, the number of comorbidities did not reveal an association with malnutrition in this study. The unfavorable associations of these findings may be because participants were young and middle-aged and had common comorbidities, such as non-communicable diseases. In addition, aspiration history during mealtimes may not be serious since most participants were independent and not diagnosed with dysphagia. In doing so, serious oral health problems may not be detected. Thus, several questions, including the complex biological interplay of inflammation between frailty and dysphagia, along with other potential physiological mechanisms underlying these associations with malnutrition, need to be examined due to the complexity of aging.

Limitation

Based on the study design and findings, some limitations should be considered. The participants in this study were selected by purposive sampling based on eligibility criteria and investigated at one tertiary hospital in Bangkok, and most of them were females. Therefore, the findings of this present study may limit generalizability to other populations or males. Another limitation is that a causal relationship between the variables of interest in the present study could not be explained entirely due to the cross-sectional design. Despite employing standard and reliable instruments, one more limitation regarding the potential bias of different approaches—face-to-face and telephone interviews—for data collection during COVID-19 is worth mentioning.

Conclusions and Implications for Nursing Practice and Research

According to the results of this study, it was demonstrated that frailty and activities of daily living dependence are associated and can predict malnutrition status in older adults with swallowing problems. To promote health and prevent malnutrition in older adults with swallowing difficulties, nurses or gerontological nurse practitioners, who play an essential role on the healthcare team, should be aware of the early detection of frailty, swallowing problems, and possible malnutrition. Integrating the aging process—frailty—into daily practice may be more beneficial for providing better care to older adults, which may eventually lead to a reduction in the consequences of malnutrition, such as delayed recovery or diminished quality of life in this population. Moreover, due to the investigation of this study conducted within the tertiary care setting, which has specialists and well-prepared health personnel to provide care, expanding the study to other settings (community, nursing home, or long-term care facility) may provide

additional information regarding risk identification and stratification, leading to better care with comprehensive management of frailty and malnutrition in older people with swallowing problems.

Acknowledgments

We are grateful for the participants' time and contributions and the Faculty of Graduate Studies of Mahidol University Alumni Association for partial grant support.

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ภาวะเปราะบางเป็นตัวทำนายภาวะทุพโภชนาการที่สำคัญในผู้สูงอายุที่มีปัญหาการกลืน

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บทคัดย่อ: กลุ่มอาการสูงอายุ—ภาวะเปราะบาง—มีผลต่อภาวะสุขภาพของผู้สูงอายุ ซึ่งผู้สูงอายุที่มีภาวะเปราะบางระยะแรกและเมื่อเข้าสู่ภาวะเปราะบาง มีแนวโน้มที่จะเกิดภาวะพร่องโภชนาการ หรือภาวะทุพโภชนาการอย่างรุนแรง การศึกษาภาวะเปราะบางและความสัมพันธ์ระหว่างภาวะเปราะบางกับภาวะทุพโภชนาการในผู้สูงอายุไทยยังมีอยู่อย่างจำกัด วัตถุประสงค์ของการศึกษาภาคตัดขวางในครั้งนี้เพื่อหาความสัมพันธ์ของภาวะเปราะบาง และปัจจัยอื่นที่เกี่ยวข้องกับภาวะทุพโภชนาการในผู้สูงอายุที่มีปัญหาการกลืน กลุ่มตัวอย่างคือผู้สูงอายุที่มีคุณสมบัติตามเกณฑ์คัดเข้าจำนวน 120 ราย ที่เข้ารับการรักษาหรือมาติดตามผลการรักษาที่แผนกเวชศาสตร์ฟื้นฟู ณ โรงพยาบาลมหาวิทยาลัยแห่งหนึ่งในกรุงเทพมหานคร ประเทศไทย ในช่วงเวลาระหว่างเดือน กรกฎาคม 2565 - กุมภาพันธ์ 2566 การเก็บข้อมูลใช้แบบบันทึกข้อมูลส่วนบุคคลและข้อมูลด้านสุขภาพ แบบประเมินภาวะโภชนาการสำหรับผู้สูงอายุฉบับย่อ แบบประเมินภาวะเปราะบางเอดมอนตันฉบับภาษาไทย และ แบบประเมินความสามารถในการทำกิจวัตรประจำวันฉบับปรับปรุง วิเคราะห์ข้อมูลโดยใช้สถิติพรรณนา และการวิเคราะห์การถดถอยลอจิสติกเชิงพหุ

ผลการศึกษาพบว่าร้อยละ 82.5 มีภาวะเปราะบาง ประมาณร้อยละ 30 และ ร้อยละ 80 ของกลุ่มตัวอย่างมีภาวะพึ่งพา และมีภาวะเสี่ยงหรือทุพโภชนาการ ตามลำดับ ภาวะเปราะบาง อายุ โรคร่วม การมีประวัติสูดสำลัก และความสามารถในการทำกิจวัตรประจำวันสามารถร่วมกันทำนายภาวะทุพโภชนาการได้ร้อยละ 71.7 โดยผู้สูงอายุที่มีภาวะเปราะบางเพิ่มความเสี่ยง 4.47 เท่าในการเกิดภาวะทุพโภชนาการ ในขณะที่ผู้สูงอายุที่มีภาวะพึ่งพาเพิ่มความเสี่ยง 6.41 เท่าในการเกิดภาวะทุพโภชนาการ

ผลการศึกษาครั้งนี้สะท้อนข้อมูลเชิงลึกที่มีประโยชน์สำหรับบุคลากรทางการแพทย์ โดยเฉพาะพยาบาลเวชปฏิบัติผู้สูงอายุให้ตระหนักถึงความสำคัญในการคัดกรองภาวะเปราะบาง ปัญหาการกลืน และภาวะเสี่ยงหรือทุพโภชนาการตั้งแต่เนิ่น ๆ ควบคู่กับการส่งเสริมความสามารถในการทำกิจวัตรประจำวันในผู้สูงอายุ การบูรณาการการดูแลอย่างครอบคลุมเพื่อคงไว้ซึ่งความสามารถในการกลืนและการทำหน้าที่ของร่างกายในผู้สูงอายุที่มีความเสี่ยงต่อภาวะเปราะบางและภาวะทุพโภชนาการ ทำให้พยาบาลเวชปฏิบัติผู้สูงอายุสามารถพัฒนาคุณภาพการดูแลเชิงวิชาชีพได้ อันจะนำไปสู่การคงไว้ซึ่งภาวะโภชนาการที่ดีของผู้สูงอายุกลุ่มนี้

Pacific Rim Int J Nurs Res 2024; 28(2) 308-320

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