Malnutrition is associated with dysphagia in Vietnamese older adult inpatients

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ABSTRACT

Background and Objectives: The number of older adults is increasing rapidly in Vietnam. They suffer from various health problems, including malnutrition and dysphagia. By using a simple screening questionnaire such as the Mini Nutritional Assessment - Short Form (MNA-SF) and 10-item Eating Assessment Tool (EAT-10), nutritional and dysphagic status were screened in this study. The study aimed to determine the prevalence of and relationship between malnutrition and dysphagia in Vietnamese older adult inpatients. **Methods and Study Design:** The study was designed as a cross-sectional study and conducted in three large hospitals in northern Vietnam. The data about nutritional status and dysphagia status of 1007 older inpatients were collected by dietitians. **Results:** There were 71.6% of subjects at malnourished (MNA-SF score <8) and risk of malnutrition (MNA-SF score: 8–11). The prevalence of dysphagia by EAT-10 was 24.6%. The risk of dysphagia was independently associated with higher risk of malnutrition, with an odds ratio of 3.21 (95% CI: 1.93-5.31, p<0.001). In addition, malnutrition was also an independent predictor for risk of dysphagia, with an odds ratio of 3.09 (95% CI: 1.84-5.17, p<0.001). **Conclusions:** Malnutrition and dysphagia prevalence were high; and malnutrition and dysphagia have a strong relationship among older adult inpatients in Vietnam. Therefore, nutritional and dysphagia screening at hospital admission are very important and recommended.

Key Words: older adults, patients, hospital, dysphagia, malnutrition

INTRODUCTION

Vietnam is one of the countries with the fastest population aging in the world. In 2019, the proportion of the population aged 65 and over was about 7.7% and it will double in about 15 years.[1] Aging is associated with a decline in several physiological functions that can impact nutritional status, including reduced lean body mass, digestion ability, changes in the oral cavity, sensory function deficits, changes in fluid and electrolyte regulation and chronic illness. A term often mentioned in older adults is “frailty”. Frailty develops as a consequence of age-related decline in multiple physiological systems, which collectively results in a vulnerability to sudden health status changes triggered by relatively minor stressor events. Frailty and malnutrition have a strong relationship and may be overlapped, as has been found in hospitalized older adults.[2-4] It is important to identify patients at risk for malnutrition at an early stage, to start interventions to improve their nutritional status and prevent frailty. However, malnutrition screening has not yet become common in Vietnamese hospitals. The

Mini Nutritional Assessment – Short Form (MNA-SF) is a simple tool to screen for nutritional status and also can be useful for frailty screening in older adults.[5] Therefore, by using this simple tool, a large older adult inpatient population in some Vietnamese hospitals can be screened for nutritional status.

Malnutrition has many related risk factors. Among these, dysphagia (difficulty in swallowing) is a problem of concern in older adults. Dysphagia affects up to 30% of those admitted to the hospital.[6] In developed countries, patients are screened and assessed for dysphagia, then a texture modified diet (TMD) and thickening liquid are served for the dysphagia patients. However, in Vietnam, dysphagia has not yet become a concern. Dysphagia screening and TMD have not been implemented in Vietnamese hospitals. Dysphagia patients consume soft food (porridge) and liquid without thickening agents, or are prescribed tube feeding. A simple dysphagia screening tool that has high sensitivity and specificity such as the 10-item Eating Assessment Tool (EAT-10) may be suitable to apply in the present situation in Vietnamese hospitals. EAT-10 is a symptom-specific tool, commonly used in clinical practice, and useful in documenting a subjective evaluation of dysphagia or initial symptom severity.[7]

This study aimed to determine the prevalence of and relationship between malnutrition and dysphagia in Vietnamese older adult inpatients.

MATERIALS AND METHODS

Settings and sample

The study was designed as a cross-sectional study and was conducted from 2018 to 2019. This research was implemented under the Declaration of Helsinki and approved by the Hanoi Medical University's ethical committee, number 1318. The study population consisted of older adult inpatients being treated in three large general hospitals in Vietnam: Hanoi Medical University Hospital (500 beds), Dong Da General Hospital (800 beds) and National Geriatric Hospital (500 beds).

Subjects were recruited for the study from all newly admitted patients, i.e., patients in the first 48 hours after admission, by random selection (using a random number table) from admission registers.

The sample size was about one thousand subjects who met the inclusion criteria: (1) hospitalized older adults in the above three hospitals, (2) age 65 or over. The exclusion criteria included: (1) refusal to participate in this study, (2) mute, deaf or psychotic and (3)

use of a ventilator, coma, trauma or injury. All potential subjects completed questionnaires and were screened using swallowing tests (Figure 1).

Data collection

All the questionnaires were administered by investigators. The investigators were dietitians who were trained to collect the study data. Before implementing the actual study, we conducted a pilot study on 50 patients to revise the instruments.

Below is the information that we obtained.

Demographic data

Data such as age, gender, diagnosed diseases were collected from medical records.

Dysphagia screening

10 item - Eating assessment tool (EAT-10) questionnaire

EAT-10, a self-reported validated questionnaire that assesses the perception of swallowing difficulty, was used to evaluate dysphagia risk. There are 10 simple questions with a total score of 40 points and the cut-off point is 3. If the total score ≥ 3 points, it means the patient may have problems swallowing efficiently and safely.[7]

Nutritional parameters

Anthropometric measurement

If patients could stand, weight and height were measured by Tanita scales BC-760-WH (Tokyo, Japan) and Seca height metter 217 (Germany), respectively. Weight was gathered in the morning before eating and after toilet. Patients removed their shoes and wore only hospital clothes. Body mass index (BMI) was calculated using base weight and height. If patients could not stand, we used circumference of the leg as an indicator to screen nutrition by MNA-SF.[8]

Mini nutritional assessment – short form (MNA-SF)

Various scales have been used to perform a quick initial nutritional assessment. The MNA-SF is used globally. Although it does not require special equipment, it has high sensitivity and specificity for assessing malnutrition risk in older adults in multiple settings, including hospitals.[9, 10] The MNA-SF consists of 6 questions about reduction in food intake over the past 3 months, weight loss during the past 3 months, mobility, psychological stress or acute disease in the past 3 months, neuropsychological problems, and BMI and it is scored 0–14.

Nutritional status is categorized as normal nutritional status, at risk of malnutrition, and malnourished by MNA-SF scores of 12–14, 8–11, and 0–7, respectively.[8]

Mid-upper arm circumference (MUAC)

MUAC was measured with a dedicated tape. MUAC is the circumference of the arm (usually measured on the non-dominant side) in centimeters at the mid-point between the acromion (the lateral extension of the spine of the scapula, forming the highest point of the shoulder) and the olecranon (the bony projection of the ulna at the elbow).[11]

Muscle strength

Muscle strength was assessed using hand-grip strength. A hand dynamometer (MP-HDM03-BK, China) was used to measure hand-grip strength. The mean of three measurements from each hand was recorded. In cases of parenteral nutrition or paralysis, a mean of three measurements was used from the dominant hand.

Statistical analysis

All statistical analyses were performed using the Stata version 12.0 software. Categorical variables were expressed as the number of patients (percentage), and quantitative variables, including parametric and nonparametric values evaluated by the histogram, were expressed as mean ± standard deviation (SD) such as age and MUAC. Comparisons between groups were made using the Chi square test and Student's t-test for categorical variables and quantitative variables, respectively. The strength of the association between the risk of malnutrition and dysphagia, and physical outcomes were also tested using multivariate logistic regression models and expressed by odds ratio (OR) and confidence interval (CI). *p*-values of less than 0.05 were considered statistically significant for all the analyses.

RESULTS

Table 1 shows the characteristics of subjects classified by nutritional status. The older adult patients considered in the study were composed of 1007 subjects (41.7% male, 58.3% female) with a mean age of 75.5±7.2 years. There were about 24% of subjects suffering from diseases related to dysphagia such as neurologic disorders, esophageal disorders and respiratory & latrogenic disorders. Pneumonia prevalence was 13.5%. The dysphagia rate by the EAT-10 tool was 24.6%. The mean of hand-grip strength, BMI and MUAC were 14.3 kg and 21.7 kg/m^2 and 24.7 cm, respectively. There were about 30% of subjects with dentures. There were

71.6% of subjects who suffered from malnutrition/ risk of malnutrition. The malnutrition group had a mean age which was higher than that of the non-malnutrition group (76.4 and 73.4 years old). Pneumonia and dysphagia prevalence in the malnutrition group was also higher than in the non-malnutrition group. Hand-grip strength, BMI and MUAC for the malnutrition group was lower than for the non-malnutrition group. The differences had statistical significance with $p<0.05$.

Table 2 indicates the relationship between nutritional status by MNA-SF and dysphagia status by EAT-10. The malnutrition prevalence in the dysphagia group was higher than in the non-dysphagia group (about 90% and 65%, respectively). In detail, the rate of severely declined food intake over the past 3 months in the dysphagia group was more than in the non-dysphagia group (about 21% and 7%, respectively). The percentage of patients in the dysphagia group who had involuntary weight loss greater than 3 kg during the last 3 months was higher than in the non-dysphagia group (16% and 6%, respectively). Dysphagia subjects had reduced mobility, psychological stress and neuropsychological problems that were more severe than in the non-dysphagia group. In addition, BMI and calf circumference of the dysphagia group were also lower than in the non-dysphagia group.

Table 3 shows the logistic regression multivariate model for risk of malnutrition (MNA-SF) according to gender, age, risk of dysphagia (EAT-10), pneumonia, MUAC, hand-grip strength and denture. The analysis described gender, age, EAT-10, pneumonia, MUAC, hand-grip strength as independent predictors for MNA-SF, with odds ratio of 0.51 (95% CI: 0.34-0.78, $p<0.01$), 1.03 (95% CI: 1.00-1.05, $p=0.03$), 3.21 (95% CI: 1.93-5.31, $p<0.001$), 2.31 (95% CI: 1.19-4.51, $p=0.01$), 0.71 (95% CI: 0.66-0.76, $p<0.001$), 0.96 (95% CI: 0.93-0.99, $p=0.01$), respectively.

Table 4 indicates the logistic regression multivariate model for risk of dysphagia (EAT-10) according to gender, age, MNA-SF, BMI, MUAC, hand-grip strength and denture. The analysis described age, MNA-SF, hand-grip strength as independent predictors for EAT-10, with an odds ratio of 1.03 (95% CI: 1.00-1.05, $p=0.04$), 3.09 (95% CI: 1.84-5.17, $p<0.001$), 0.94 (95% CI: 0.91-0.97, $p<0.001$), respectively.

Figure 2 shows a conceptual diagram about malnutrition and dysphagia which was based on results in table 3 and 4.

DISCUSSION

This may be the first study in Vietnam which was conducted with a large number of older adult inpatients at hospital admission to assess prevalence, predictors of malnutrition, and

dysphagia risk. The present study showed that there was high prevalence of risk of malnutrition/malnutrition and dysphagia. In addition, malnutrition and dysphagia have a strong relationship.

Malnutrition and dysphagia were common problems among older adult inpatients at the admission stage in Vietnam. More than half of the subjects were at risk of malnutrition, and about 17% were malnourished by MNA-SF. The risk of dysphagia prevalence was 24.6% by EAT-10. In the malnutrition group, hand-grip strength, BMI and MUAC were lower than in non-malnutrition group. These are three indicators which are easily measured by simple equipment and also are good parameters to screen malnutrition alongside MNA-SF questionnaires.[12-14] In addition, in this study, by using a simple screening tool with high sensitivity and specificity like EAT-10, dysphagia could also be screened.[7] In the dysphagia group, the rate of malnutrition and risk of malnutrition were higher than in the non-dysphagia group. In detail, some other indicators in the dysphagia group, such as decreased food intake over the past 3 months, involuntary weight loss during the last 3 months, mobility, psychological stress, neuropsychological problem, BMI and CC, were also worse than in the non-dysphagia group.

Nutrition status and dysphagia screening are not routinely done in most Vietnamese hospitals; only some large hospitals can perform them. Timely screening is necessary, as early identification is one of the most important and effective ways to prevent and reduce the prevalence of malnutrition and dysphagia risk. Through this study, some suitable nutritional and dysphagia screening methods were introduced to Vietnamese hospitals and step by step dietitians will transfer to nurses the skills to set up nutritional and dysphagia screening systems in hospitals.

In addition, older adult patients with nutrition problems can be identified in the community before admission by applying the simple screening tools in this study. It is very important and recommended to have early malnutrition detection systems in place in the community to prevent malnutrition and dysphagia. When admitted to the hospital, patients without malnutrition can make a better recovery, and reduce length of hospital stay and medical costs.[15] MNA-SF can be used not only in hospitals but also for community nutritional status screening.[16] After nutrition screening by MNA-SF or other tools, with patients with a risk of malnutrition or malnutrition, nutrition assessment and diagnosis should be implemented. Global Leadership Initiative on Malnutrition (GLIM) criteria was established recently to diagnose malnutrition.[17] We would like to apply the GLIM criteria in further studies on the Vietnamese population.

The relationship between malnutrition and dysphagia and some factors such as gender, age, pneumonia, BMI, MUAC, hand-grip strength and denture were observed in this study. The results of logistic regression multivariate models showed that gender, age, EAT-10, pneumonia, MUAC, hand-grip strength were independently associated with higher risk of malnutrition. In addition, predictor risks leading to dysphagia in this study were age, malnutrition (MNA-SF) and handgrip strength. Pneumonia is among the top ten leading causes of death in Vietnam.[18] Risk factors leading to pneumonia that are usually mentioned include tobacco use and influenza. However, with high rates of aging and dysphagia in Vietnam, aspiration pneumonia also should be a concerning problem. Additionally, malnutrition also has an effect on the risk and outcome of pneumonia.[19] Hand-grip strength is also a predictor of nutrition status and dysphagia in this study. Hand-grip strength can be easily measured in hospitals. Hand-grip strength may reflect the muscle strength of the whole body, including muscles involved in swallowing functions.[20] Consequently, the proportion of older adult patients who had low hand-grip strength in the dysphagia group was higher than in the non-dysphagia group.[21]

The pathogenesis of dysphagia in older adults is probably complex and, controversially, sometimes referred to as presbyesophagus.[22] In this study, we first hypothesized malnutrition as the dependent variable and dysphagia as one of the independent factors. And the results of this study showed that dysphagia was a high risk factor that can lead to malnutrition. And then the opposite hypothesis was made and the results indicate that malnutrition was also one of the high risk factors that lead to dysphagia. Another study has also shown results similar to our study.[23] Therefore, malnutrition and dysphagia are like a vicious cycle and have a strong relationship.

At the time of this study, TMD had not yet been established. Tube feeding or soft food, for example porridge or noodles, was being served to patients. Thickening agents had not yet been used in the diet of dysphagia patients. In 2015, the International Dysphagia Diet Standardization Initiative (IDDSI) was established and it became necessary to classify textures of foods served in Vietnamese hospitals.[24] Further TMD improvement strategies in hospitals should be implemented to support the nutritional status of dysphagia patients. In addition, the creation of guidelines for nutritional management of patients with swallowing disorders and the development of effective methods of nutrition education are needed.[25-27] This may be the way to break the vicious circle of malnutrition and dysphagia among Vietnamese older adult patients.

Conclusion

Malnutrition and dysphagia prevalence were high; and malnutrition and dysphagia have a strong relationship in older adult inpatients in Vietnam. Therefore, the role of nutritional and dysphagia screening at admission hospital are very important and they are recommended.

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AUTHOR DISCLOSURE

The authors declare that they have no conflict of interest.

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Table 1. Characteristics of subjects classified by nutritional status (n=1007)

Characteristics	Overall (n=1007)	Malnutrition/Risk of malnutrition (n=721)	Non-malnutrition (n=286)	*p*-value
Age, (Mean±SD)	75.5±7.2	76.4±7.6	73.4±6.0	<0.05†
Female, n (%)	587 (58.3)	409 (56.7)	178 (62.2)	0.11‡
Disease				
Neurologic disorders, n (%)	113 (11.2)	97 (13.5)	16 (5.6)	
Esophageal disorders, n (%)	63 (6.3)	51 (5.1)	12 (4.2)	
Respiratory & latrogenic disorders, n (%)	65 (6.5)	56 (5.6)	9 (3.1)	
Other, n (%)	766 (76.0)	517 (51.3)	249 (87.1)	
Pneumonia, n (%)	136 (13.5)	123 (17.1)	13 (4.5)	<0.05‡
EAT-10 score ≥3, n (%)	248 (24.6)	224 (31.1)	24 (2.4)	<0.05‡
Hand-grip strength (kg), (Mean± SD)	14.3±7.4	13.4±7.3	16.3±7.3	<0.05†
BMI (kg/m^2), (Mean± SD)	21.7±3.7	20.6±3.3	24.2±3.1	<0.05†
MUAC (cm), (Mean± SD)	24.7±2.9	23.9±2.7	26.5±2.5	<0.05†
Denture, n (%)	301 (29.9)	210 (29.1)	91 (31.8)	0.42‡

†Unpaired Student's t-test.
‡Chi-square test.

Table 2. Relationship between nutritional status (MNA-SF) and dysphagia status (EAT-10) (n=1007)

MNA-SF items	Overall (n=1007) N (%)	Dysphagia (n=248) N (%)	Non- dysphagia (n=759) N (%)	*p*-value
Food intake declined over the past 3 months				<0.05
Severe decrease	105 (10.4)	51 (20.5)	54 (7.1)	
Moderate decrease	443 (44.0)	112 (45.2)	331 (43.6)	
No decrease	459 (45.6)	85 (34.3)	374 (49.3)	
Involuntary weight loss during the last 3 months				<0.05
Weight loss greater than 3 kg	87 (8.6)	39 (15.8)	48 (6.3)	
Does not know	181 (18.0)	74 (29.8)	107 (14.1)	
Weight loss between 1 and 3 kg	313 (31.1)	66 (26.6)	247 (32.5)	
No weight loss	426 (42.3)	69 (27.8)	357 (47.1)	
Mobility				<0.05
Bed or chair bound	126 (12.5)	71 (28.6)	55 (7.3)	
Able to get out of bed/chair, but does not go out	315 (31.3)	103 (41.5)	212 (27.9)	
Goes out	566 (56.2)	74 (29.9)	492 (64.8)	
Psychological stress in the past three months				<0.05
Yes	194 (19.3)	68 (27.4)	126 (16.6)	
No	813 (80.7)	180 (72.6)	633 (83.4)	
Neuropsychological problem				<0.05
Severe dementia or depression	32 (3.2)	19 (7.7)	13 (1.7)	
Mild dementia	428 (42.5)	136 (54.8)	292 (38.5)	
No psychological problems	547 (54.3)	93 (37.5)	454 (59.8)	
Body mass index (BMI)				<0.05
BMI less than 19	185 (18.4)	50 (20.2)	135 (17.8)	
BMI 19 to less than 21	156 (15.5)	33 (13.3)	123 (16.2)	
BMI 22 to less than 23	195 (19.4)	32 (12.9)	163 (21.5)	
BMI 23 to greater	292 (29.0)	47 (19.0)	245 (32.3)	
Calf circumference (CC)				<0.05
CC less than 31	122 (12.1)	71 (28.6)	51 (6.7)	
CC 31 or greater	57 (5.6)	15 (6.0)	42 (5.5)	
Screening score				<0.05
12-14 points: Normal nutritional status	286 (28.4)	24 (9.6)	262 (34.5)	
8-11 points: At risk of malnutrition	547 (54.3)	112 (45.2)	435 (57.3)	
0-7 points: Malnutrition	174 (17.3)	112 (45.2)	62 (8.2)	

Table 3. Logistic Regression Multivariate model for risk of malnutrition/malnutrition (MNA-SF) according to gender, age, risk of dysphagia (EAT-10), pneumonia, MUAC, hand-grip strength and denture

Indicators	OR (95% CI)	*p*-value
Gender (male vs female)	0.51 (0.34-0.78)	<0.01
Age (years)	1.03 (1.00-1.05)	0.03
EAT-10 (no vs yes - risk of dysphagia)	3.21 (1.93-5.31)	<0.001
Pneumonia (no vs yes)	2.31 (1.19-4.51)	0.01
MUAC (cm)	0.71 (0.66-0.76)	<0.001
Hand-grip strength (kg)	0.96 (0.93-0.99)	0.01
Denture (no vs yes)	0.99 (0.70-1.39)	0.96

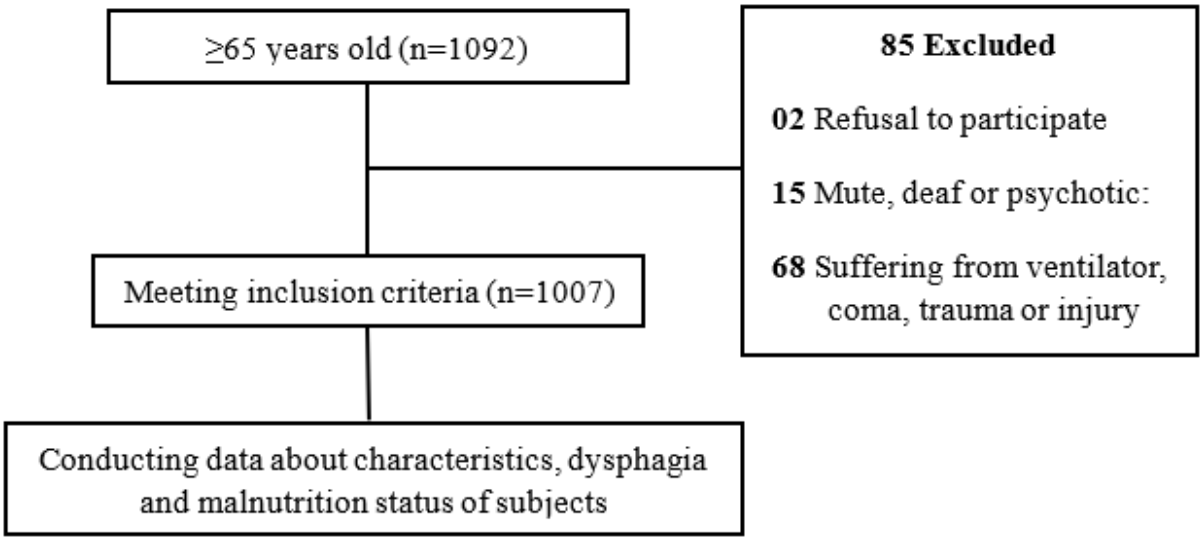

Figure 1. Diagram of study participants.

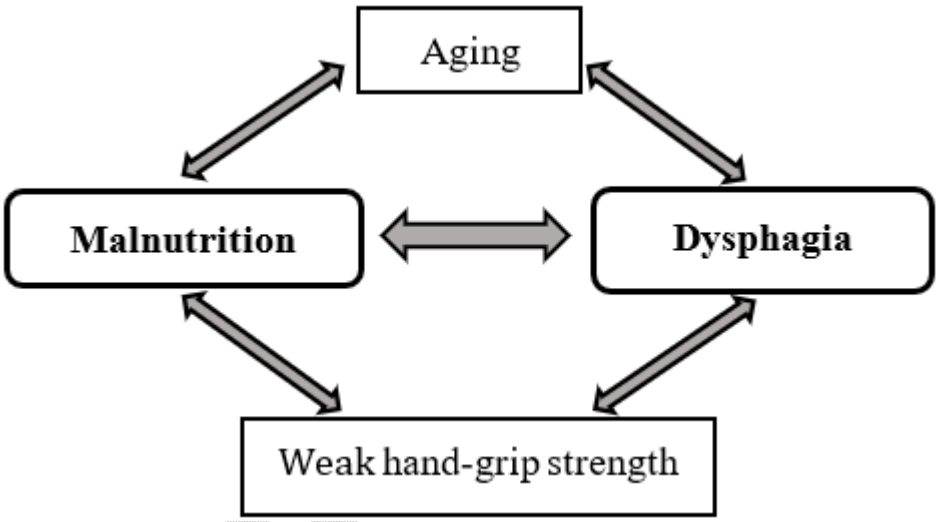

Figure 2. A conceptual diagram about malnutrition and dysphagia.