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FACTORS ASSOCIATED WITH FRAILTY AMONG HOSPITALIZED OLDER ADULTS AT CAN THO CENTRAL GENERAL HOSPITAL: A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Population ageing has become a major global trend, accompanied by an increasing prevalence of geriatric syndromes such as frailty. Frailty is characterized by reduced physiological reserve and increased vulnerability to stressors, leading to adverse outcomes including disability, prolonged hospitalization, and mortality. Data on frailty among hospitalized older adults in Vietnam remain limited. **Objectives:** To determine the prevalence of frailty and to identify the associated factors with frailty among hospitalized older adults at Can Tho Central General Hospital. **Materials and methods:** A cross-sectional study was conducted at the Department of Geriatrics, Can Tho Central General Hospital from August to September 2025. Hospitalized patients aged ≥ 60 years were recruited using convenience sampling. Frailty was assessed using the Clinical Frailty Scale, with Clinical Frailty Scale ≥ 5 defined as frailty. Data on demographic characteristics, nutritional status, dietary diversity, comorbidities, and functional status (ADL and IADL) were collected through interviews and medical record review. Logistic regression analysis was performed to identify factors associated with frailty. **Results:** A total of 123 patients were included, with a mean age of 75.1 ± 9.3 years; 67.5% were female. Overall, 74.0% of patients were classified as frail, including 58.5% with mild-moderate frailty and 15.5% with severe frailty. Multivariable analysis showed that increasing age (OR = 1.34; 95% CI: 1.17-1.55; $p < 0.001$) and a higher number of comorbidities (OR = 3.25; 95% CI: 1.75-6.02; $p < 0.001$) were independently associated with frailty whereas adequate dietary intake was inversely associated with frailty (OR = 0.07; 95% CI: 0.01-0.48; $p = 0.007$). **Conclusion:** Frailty is highly prevalent among hospitalized older adults. Routine frailty screening using the Clinical Frailty Scale may help identify high-risk patients and support early geriatric interventions to improve clinical outcomes.

Keywords: Frailty, older adults, Clinical Frailty Scale multimorbidity, diet.

I. INTRODUCTION

Population ageing has become a major global demographic trend. In 2019, approximately 703 million people worldwide were aged 65 years or older, and this number is projected to double by 2050 [1]. Along with increasing longevity, geriatric syndromes have become more prevalent, among which frailty is particularly important. Frailty is characterized by a decline in physiological reserve and increased vulnerability to stressors, leading to a higher risk of adverse outcomes such as falls, disability, prolonged hospitalization, and mortality [2].

Frailty is especially relevant among hospitalized older adults, whose clinical characteristics often differ from those of community-dwelling elderly individuals.

Hospitalized patients commonly present with acute illnesses, multiple comorbidities, polypharmacy, and functional impairment, all of which may exacerbate frailty and complicate treatment decisions. The presence of frailty in this population has been associated with poorer clinical outcomes, longer hospital stays, and increased healthcare utilization [3]. Therefore, early recognition of frailty in hospitalized older adults is essential to guide appropriate management strategies and optimize treatment outcomes.

Several tools have been developed to assess frailty, including the frailty phenotype proposed by Fried and the Clinical Frailty Scale (CFS). Among these, the CFS is widely used in clinical practice because of its simplicity and its ability to reflect overall functional status [2]. However, data on the prevalence of frailty and its associated factors among hospitalized older adults in Vietnam remain limited. Therefore, this study aimed to determine the prevalence of frailty and to identify the associated factors with frailty among hospitalized older adults at Can Tho Central General Hospital.

II. MATERIALS AND METHODS

2.1. Participants

The study was conducted at the Department of Geriatrics, Can Tho Central General Hospital from August to September 2025.

- **Inclusion criteria:** Participants were hospitalized patients aged ≥ 60 years. Patients were eligible if they were able to answer interview questions or had caregivers who could provide reliable information and agreed to participate in the study.

- **Exclusion criteria:** Exclusion criteria included coma; severe cognitive impairment preventing communication; severe acute illnesses (e.g., respiratory failure, septic shock, acute coronary syndrome, severe heart failure NYHA III-IV, acute stroke, severe pneumonia, acute exacerbation of chronic lung disease, or gastrointestinal bleeding); and physical disabilities interfering with frailty assessment (e.g., bilateral blindness, limb amputation, or recent limb surgery within 3 months).

2.2. Research methods

- **Study design:** Cross-sectional prospective study.

- **Sample size and sampling**

The sample size was calculated using the formula for estimating a proportion:

$$n = \frac{Z_{1-\alpha/2}^2 \cdot p \cdot (1 - p)}{d^2}$$

Assuming a frailty prevalence of 54.9% based on a previous study[4], a precision of 0.1, and a confidence level of 95%, the minimum required sample size was 96. A total of 123 patients were finally included using convenience sampling.

- **Contents of the study:** Collected variables included: Demographic characteristics: age, sex, residence, education level, marital status, living arrangement, and economic status. Lifestyle factors: smoking, alcohol consumption, and dietary diversity score based on the Food and Agriculture Organization (FAO) recommendations: One point was assigned for each food group consumed, yielding a total score ranging from 0 to 8. Scores ≥ 5 were classified as adequate dietary diversity, while scores < 5 were considered poor dietary diversity [5]. Nutritional status: body mass index (BMI) categorized according to Asian criteria. Comorbidities: number and type of chronic diseases, including hypertension, type 2 diabetes mellitus, ischemic heart disease, chronic lung disease, heart failure (NYHA I-II),

osteoporosis, chronic kidney disease, cerebrovascular disease, and osteoarthritis. Acute admission diagnoses such as pneumonia, infection, and gastroenteritis also were recorded.

Assessment of frailty: Frailty was assessed using the Clinical Frailty Scale (CFS) from the Canadian Study of Health and Aging [3], CFS was assessed within the first 48 hours of admission by doctors from the Department of Geriatrics based on the patient's baseline functional status two weeks prior to hospitalization. Patients were classified into nine levels (1-9). Frailty was defined as CFS ≥ 5 , while CFS 1-4 indicated non-frailty. Patients with CFS 9 (terminally ill) were excluded.

Functional status was evaluated using the Activities of Daily Living (ADL) scale by Katz [6] and the Instrumental Activities of Daily Living (IADL) scale by Lawton-Brody [7], Vietnamese translate by Department of Geriatrics, Can Tho Central General Hospital. The Katz ADL scale ranges from 0-6, with higher scores indicating greater independence in basic daily activities. The Lawton-Brody IADL scale ranges from 0-8, with higher scores reflecting better functional independence in instrumental daily activities.

- **Data collection procedure:** Data were collected through interviews and medical record reviews within the first 48 hours of hospital admission using a standardized questionnaire.

- **Data analysis:** Data were analyzed using IBM SPSS Statistics version 23.0. Categorical variables were presented as frequencies and percentages, while continuous variables were expressed as mean $\pm$ standard deviation or median with interquartile range as appropriate. Associations between frailty and potential factors were examined using the chi-square test for categorical variables and Pearson correlation for continuous variables. Logistic regression analysis was performed to identify factors associated with frailty. Statistical significance was set at $p < 0.05$ with a 95% confidence interval.

- **Ethics Approval:** This study complied with ethical principles of biomedical research. Participation was voluntary, and all patient information was kept confidential. The study protocol was approved by the Ethics Committee of Can Tho Central General Hospital (Approval No: 3641/QD-BVDKTW, dated 12/24/2025).

III. RESULTS

During the study period from August to September 2025, a total of 123 eligible patients who met the inclusion criteria were enrolled in the study. The results are presented below:

3.1. Characteristics of the study participants

Table 1. General characteristics of study participants

Characteristics	Value (n = 123)	Percentage or Range
Age (years) Mean $\pm$ SD	75.1 $\pm$ 9.3	Range (60-98)
Sex		
Male	40	32.5
Female	83	67.5
Education level		
Illiterate	21	17.1
Primary school	59	48.0
Secondary school	25	20.3
High school	12	9.8
Above high school	6	4.9
Living arrangement		

Characteristics	Value (n = 123)	Percentage or Range
Living with family	121	98.4
Living alone	2	1.6
Economic status		
Poor/near-poor household	8	6.5
Non-poor household	115	93.5
BMI (kg/m ²)		
Underweight (<18.5)	12	9.8
Normal (18.5-22.9)	69	56.1
Overweight/obese (≥23)	42	34.1
Diet diversity		
Poor	33	26.8
Adequate	90	73.2

The mean age of the participants was 75.1 ± 9.3 years, ranging from 60 to 98 years. Females accounted for a higher proportion than males (67.5% versus 32.5%). Regarding educational level, nearly half of the participants had completed primary school (48.0%), while only a small proportion had education above high school (4.9%). Most participants were living with their families (98.4%) and belonged to non-poor households (93.5%). In terms of nutritional status based on BMI, the majority had normal BMI (56.1%), followed by overweight/obesity (34.1%), while 9.8% were underweight. Most participants reported adequate dietary diversity (73.2%), whereas 26.8% had poor diet diversity.

3.2. The prevalence of frailty among study population

Table 2. Comorbidities among study participants

Variable	Value	Percentage (%)
Number of comorbidities (Mean $\pm$ SD)	3.1 ± 1.8	Range (1-9)
Comorbidity		
Hypertension	77	62.6
Type 2 diabetes mellitus	54	43.9
Adrenal insufficiency	35	28.5
Pneumonia	32	26.0
Osteoarthritis	32	26.0
Gastroesophageal reflux disease	22	17.9
Infection	22	17.9
Ischemic heart disease	20	16.3
Gastroenteritis	15	12.2
Chronic obstructive pulmonary disease	13	10.6
Chronic kidney disease	12	9.8
Osteoporosis	8	6.5
Heart failure	5	4.1
Others	53	43.1

The mean number of comorbidities among the participants was 3.1 ± 1.8 , ranging from 1 to 9 conditions. Hypertension was the most common comorbidity (62.6%), followed by type 2 diabetes mellitus (43.9%). Adrenal insufficiency was present in 28.5% of participants, while pneumonia and osteoarthritis were each reported in 26.0%. Other relatively common conditions included gastroesophageal reflux disease and infections (17.9% each), as well as

ischemic heart disease (16.3%). Gastroenteritis (12.2%), chronic obstructive pulmonary disease (10.6%), and chronic kidney disease (9.8%) were also observed.

Table 3. Frailty status and functional dependency among study participants (n = 123)

Variable	Category	Value	Percentage %
Frailty status (Clinical Frailty Scale - CFS)	Non-frail	32	26.0
	Mild-moderate frailty	72	58.5
	Severe-very severe frailty	19	15.5
Activities of Daily Living (ADL - Katz)	0	4	3.3
	1	5	4.1
	2	10	8.1
	3	11	8.9
	4	32	26.0
	5	23	18.7
	6	38	30.9
Instrumental Activities of Daily Living (IADL - Lawton)	Independent (7-8)	38	30.9
	Mild impairment (5-6)	25	20.3
	Moderate impairment (3-4)	37	30.1
	Severe impairment (0-2)	23	18.7

Overall, 74.0% of patients were classified as frail according to the CFS. Regarding functional status, 30.9% of participants were fully independent in basic daily activities (ADL score = 6). For instrumental activities of daily living, only 30.9% were independent, while 48.8% had moderate-to-severe impairment.

3.3. The associated factors with frailty among study population

Table 4. Univariate and multivariate logistic regression analysis of factors associated with frailty

Variable	Univariate β	OR (95% CI)	p	Multivariate β	OR (95% CI)	p
Sex	0.487	1.627 (0.656-4.036)	0.294	0.539	1.713 (0.377-7.781)	0.486
Age	0.210	1.233 (1.128-1.349)	<0.001	0.295	1.343 (1.167-1.547)	<0.001
Education level	0.080	1.083 (0.727-1.612)	0.695	-	-	-
Family economic status	-1.450	0.235 (0.029-1.894)	0.174	-	-	-
Diet	-2.048	0.129 (0.029-0.576)	0.007	-2.663	0.070 (0.010-0.476)	0.007
BMI	-0.119	0.888 (0.780-1.011)	0.072	-	-	-
Number of comorbidities	1.035	2.816 (1.726-4.593)	<0.001	1.179	3.250 (1.753-6.023)	<0.001

Note: OR = odds ratio; CI = confidence interval.

Variables with $p < 0.20$ in univariate analysis and clinically relevant variables were entered into the multivariable logistic regression model. The final model demonstrated acceptable goodness-of-fit (Hosmer-Lemeshow test, $p > 0.05$). In multivariable analysis, older age and a higher number of comorbidities were independently associated with

increased odds of frailty. Adequate dietary intake was identified as a inverse association. Sex was not significantly associated with frailty.

IV. DISCUSSION

4.1. The prevalence of frailty among study population

Frailty prevalence varies widely depending on the study population and setting. In this study, 74.0% of patients were classified as frail, including 58.5% with mild-moderate frailty and 15.5% with severe-very severe frailty. This high prevalence likely reflects the characteristics of hospitalized geriatric patients, who often present with advanced age, multiple chronic conditions, and higher vulnerability. A community-based data summarized by Sanne M. Collard estimated frailty prevalence at 10.7% in individuals aged ≥ 65 years [8]. These differences highlight the important influence of clinical setting, with hospitalized populations consistently demonstrating higher frailty burden than community or outpatient cohorts.

Functional status assessment also showed substantial impairment in this population. Based on the Katz ADL scale, only 30.9% of patients remained fully independent, whereas 44.7% had mild dependency and 24.4% had moderate-to-severe dependency. This distribution is consistent with the typical functional decline observed among hospitalized older adults. In a systematic review and meta-analysis, Belayneh Amlak estimated the pooled prevalence of ADL disability at 26.07% (95% CI: 19.04-32.74), supporting the importance of routine functional assessment in geriatric care [9].

Impairment in instrumental activities of daily living (IADL) was also common in our study. Only 30.9% of participants were fully independent, whereas mild, moderate, and severe impairment accounted for 20.3%, 30.1%, and 18.7%, respectively. These findings indicate that most patients required assistance with more complex activities such as medication management, transportation, and financial tasks. A community-based research by Henrik Pedersen reported a much lower prevalence of 11.5%, further suggesting that hospitalized populations with multiple comorbidities tend to exhibit substantially greater functional decline. Collectively, these findings emphasize the close relationship between frailty, multimorbidity, and functional dependence in older inpatients, underscoring the importance of comprehensive geriatric assessment in this population.

4.2. The associated factors with frailty among study population

In the univariate logistic regression analysis, age, dietary status, and number of comorbidities were significantly associated with frailty according to the CFS ($p < 0.05$). Increasing age was an important associated factor. The association between age and frailty observed in this study may reflect the markedly higher frailty burden among the oldest hospitalized patients. In contrast, an adequate diet showed a strong protective effect, reducing the risk of frailty by 87.1%, consistent with evidence that proper nutrition helps maintain muscle mass, strength, and functional capacity in older adults. The number of comorbidities was the strongest predictor: each additional comorbidity increased the odds of frailty 2.82-fold, highlighting the cumulative burden of chronic disease in the development of frailty.

Similar findings have been reported in previous studies. Kacmaz identified several significant predictors of frailty, including female sex, comorbidities, history of falls, urinary incontinence, and functional dependence in ADL and IADL [10]. Likewise, Xu reported

significant associations between frailty and age, comorbidities, polypharmacy, falls, and functional status.

Multivariable logistic regression confirmed that age, number of comorbidities, and dietary status remained independently associated with frailty. The number of comorbidities was the strongest predictor (OR = 3.25; 95% CI: 1.75-6.02; $p < 0.001$), indicating that each additional comorbidity increased frailty risk more than threefold. Age also showed a significant effect (OR = 1.34 per year; 95% CI: 1.17-1.55; $p < 0.001$), with frailty risk increasing markedly with advancing age. Conversely, good dietary intake remained a strong protective factor (OR = 0.07; 95% CI: 0.01-0.48; $p = 0.007$)[11].

Overall, these findings suggest that while advanced age and multimorbidity are non-modifiable associated factors, adequate nutrition represents a potentially modifiable protective factor that may help delay or mitigate frailty progression in older adults. Some potentially relevant factors associated with frailty, such as polypharmacy, cognitive impairment, and depression, were not evaluated in this study.

V. CONCLUSION

Frailty is highly prevalent among older inpatients. Age and multimorbidity are associated factors, whereas adequate dietary intake was inversely associated with frailty. Routine frailty screening using the Clinical Frailty Scale is recommended for patients aged ≥ 60 years at hospital admission, particularly among those of advanced age or with multiple comorbidities, to facilitate early identification and appropriate geriatric interventions.

REFERENCES

1. Department of Economic and Social Affairs Population Division. World Population Ageing 2023: Challenges and opportunities of population ageing in the least developed countries- Population Division. 2023. <https://www.un.org/development/desa/pd/content/launch-World-Population-Ageing-2023>.
2. Church S, Rogers E, Rockwood K, Theou O. A scoping review of the Clinical Frailty Scale. *BMC Geriatr*. 2020. 20(1), 393, <https://doi.org/10.1186/s12877-020-01801-7>.
3. Hoogendijk EO, Afilalo J, Ensrud KE, Kowal P, Onder G, *et al*. Frailty: implications for clinical practice and public health. *The Lancet*. 2019. 394(10206), 1365-1375, [https://doi.org/10.1016/S0140-6736\(19\)31786-6](https://doi.org/10.1016/S0140-6736(19)31786-6).
4. Lý Thanh Thùy. Nghiên cứu mối liên quan giữa tình trạng suy yếu và tái nhập viện ở bệnh nhân cao tuổi. Master's Thesis in Medicine, University of Medicine and Pharmacy at Ho Chi Minh City, Ho Chi Minh City. 2017.
5. Kennedy G, Ballard T, Dop M. Guidelines for measuring household and individual dietary diversity. 2011.
6. Katz S, Ford AB, Moskowitz RW, Jackson BA, Jaffe MW. Studies of illness in the aged. The index of ADL: a standardized measure of biological and psychosocial function. *JAMA*. 1963. 185:914-919, <https://doi.org/10.1001/jama.1963.03060120024016>.
7. Lawton MP, Brody EM. Assessment of older people: self-maintaining and instrumental activities of daily living. *The Gerontologist*. 1969. 9(3), 179-186. https://doi.org/10.1093/geront/9.3_Part_1.179.
8. Collard RM, Boter H, Schoevers RA, Oude Voshaar RC. Prevalence of frailty in community-dwelling older persons: a systematic review. *J. Am. Geriatr. Soc*. 2012. 60(8), 1487-1492, <https://doi.org/10.1111/j.1532-5415.2012.04054.x>.
9. Amlak BT, Getinet M, Getie A, Kebede WM, Tarekegn TT, *et al*. Functional disability in basic and instrumental activities of daily living among older adults globally: a systematic review and meta-analysis. *BMC Geriatr*. 2025. 25:413, <https://doi.org/10.1186/s12877-025-06056-8>.

10. Yücel Kaçmaz H, Döner A, Kahraman H, Akin S. Prevalence and factors associated with frailty in older hospitalized patients. *Rev. Clin. Esp.* 2023. 223(2), 67-76, <https://doi.org/10.1016/j.rceng.2022.10.001>.
 11. Xu L, Zhang J, Shen S, Liu Z, Zeng X, *et al.* Clinical Frailty Scale and Biomarkers for Assessing Frailty in Elder Inpatients in China. *J. Nutr. Health Aging.* 2021. 25(1), 77-83, <https://doi.org/10.1007/s12603-020-1455-8>.
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