

Malnutrition, Frailty, and Health-Related Quality of Life Among Rural Older Adults in Vietnam: A Cross-Sectional Study

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Purpose: Rural older adults are more likely to be malnourished than urban older adults, particularly those living in lower-middle-income countries like Vietnam. Therefore, this study aimed to address the prevalence of malnutrition and its association with frailty and health-related quality of life in older rural Vietnamese adults.

Participants and Methods: This cross-sectional study was conducted on community-dwelling older adults (aged ≥ 60 years) living in a rural province in Vietnam. Nutritional status was determined using the Mini Nutritional Assessment Short Form (MNA-SF), and frailty was evaluated using the FRAIL scale. The 36-Item Short Form Survey (SF-36) was used to evaluate health-related quality of life.

Results: Among the 627 participants, 46 (7.3%) were malnourished (MNA-SF score < 8), and 315 (50.2%) were at risk of malnutrition (MNA-SF score: 8–11). Individuals with malnutrition had significantly higher rates of impairments in instrumental activities of daily living and activities of daily living than those without malnutrition (47.8% vs 27.4% and 26.1% vs 8.7%, respectively). The prevalence of frailty was 13.5%. Risk of malnutrition and malnutrition were associated with high risks of frailty, with odds ratios of 2.14 (95% confidence interval [CI]: 1.16–3.93) and 4.78 (1.86–12.32), respectively. Furthermore, the MNA-SF score was positively correlated with eight domains of the health-related quality of life among rural older adults.

Conclusion: The prevalence rates of malnutrition, risk of malnutrition, and frailty were high among older adults in Vietnam. A strong association was observed between nutritional status and frailty. Therefore, this study reinforces the importance of screening for malnutrition and risk of malnutrition among older rural individuals. Further studies should explore whether early nutritional intervention reduces the risk of frailty among older adults and increase their health-related quality of life in the Vietnamese population.

Keywords: FRAIL scale, general health, MNA-SF, nutritional status, psychological stress, SF-36

Introduction

Nutrition is critical in maintaining health and quality of life among older adults, who are vulnerable to malnutrition due to several contributing factors, including chronic diseases, loss of teeth, and decreasing appetite.^{1,2} Hence, malnutrition remains a serious public health concern among older adults, particularly those in lower-middle-income countries like Vietnam.³ According to data published by the World Health Organization, the prevalence of malnutrition in older people ranges from 1.3% to 47.8%, and it is much higher in low- and middle-income countries than in high-income countries.⁴ An Indian study reported that 17.9% of older people had malnutrition and approximately 60% were at risk of malnutrition.⁵ Another study in Malaysia⁶ found that the prevalence rates of malnutrition and risk of malnutrition in older adults were 7.3% and 23.4%, respectively.

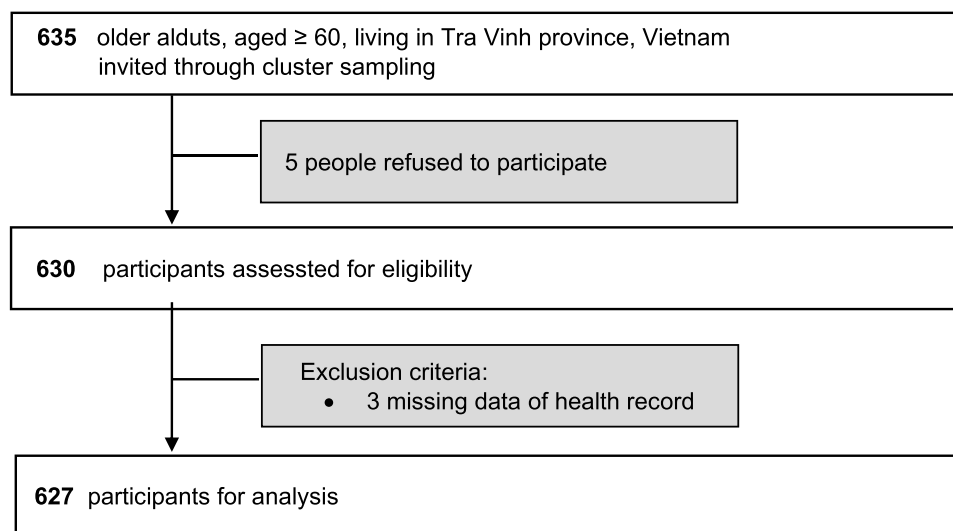


Figure 1 Flow chart of recruitment of the participants in the study.

Factors contributing to malnutrition in older adults include age-related anorexia, chronic diseases, multimorbidity, polypharmacy, and frailty.⁷ Another significant aspect of malnutrition in older adults is its adverse consequences, including sarcopenia, frailty, and falls.⁸ Approximately 70% of malnourished older individuals have frailty.⁹ Malnutrition and frailty are interrelated. Long-term malnutrition including insufficient protein and energy intake can result in weight loss, exhaustion, slow walking speed, and low physical activity which are components of the frailty phenotype.^{10,11} Malnutrition plays an important mechanism in frailty pathogenesis and is a target of frailty treatment.^{12,13} Further, frailty is a major indicator of malnutrition.⁷ Functional impairment in frail older adults such as impairments in carrying out activities such as shopping, travel, and meal preparation may lead to social isolation, food apathy, and decreased food intake.^{7,10} Furthermore, malnutrition and frailty have several common pathophysiological pathways such as weight loss, chronic diseases, cognitive and physical risk factors.⁹ Malnutrition also increases the risks of infection, hospital admission, and mortality.¹⁴ In particular, older people with malnutrition have a lower quality of life than those without malnutrition.¹⁵

Vietnam is a rapidly aging country facing challenges in maintaining the well-being of older people at risk of multimorbidity, polypharmacy, frailty, functional impairment, and mental health problems.¹⁶ Moreover, approximately 75% of the older Vietnamese population resides in rural areas, where they may have a high risk of malnutrition.¹⁷ A previous hospital-based study¹⁸ reported that 71.6% of older inpatients were malnourished or at risk of being malnourished, whereas another study found that the prevalence of malnourishment among outpatients with diabetes was 31%.¹⁹ However, to our knowledge, there are no previous studies elucidating the nutritional status of community-dwelling older people in rural areas; the problem of malnutrition in this population is often overlooked. This study aimed to address the prevalence of malnutrition and its association with frailty and health-related quality of life among older adults living in a rural province in Vietnam. The findings can inform preventive and interventional strategies for older individuals with malnutrition or at risk of malnutrition, preventing frailty, and improving their quality of life.

Materials and Methods

Study Design and Participants

We conducted a cross-sectional study in Tra Vinh province, including seven districts and 106 sub-districts with a high proportion of the Khmer people (a minority ethnic group in Vietnam) in Southern Vietnam.²⁰ Tra Vinh is a coastal province in the Mekong Delta with an economy based on agriculture and aquaculture.²⁰ According to the population statistics in 2019, the total population of Tra Vinh was around one million. People aged ≥ 60 years accounted for 12.3% of the total population, 68.2% were people aged 20–59 years, and the remainder were aged < 20 years (30.3%).²⁰ In

particular, approximately 90% of Tra Vinh's population resides in rural areas and most older adults live in the community, where there is no care service or nursing home.^{20,21}

The study was approved by the Institutional Review Board of the University of Medicine and Pharmacy at Ho Chi Minh City (Approval number: 26/HĐĐĐ-ĐHYD), complying with the Declarations of Helsinki.

We used Open Epi version 3.01 to calculate the sample size, with a prevalence of malnutrition in older people of 27%, as specified in a previous study.²² We applied an absolute precision of 5% and a confidence interval of 95%. The primary sample size was 310. Thereafter, a cluster sampling scheme was used; thus, we regarded the effect of intra-cluster correlation (the correlation within the clusters).²³ This is called the design effect, a factor used to adjust the required sample size.²⁴ Therefore, the primary sample size was multiplied by two (the design effect) to get the sample size of 620 participants.²³ Probability proportional to size sampling with 30 clusters was applied, with 21 individuals in each cluster, and one cluster being equivalent to one sub-district.

The inclusion criteria were as follows: age ≥ 60 years, residence in the community in Tra Vinh province for ≥ 1 year, existence of medical records with a primary care practice, ability to communicate, and the capacity to provide consent for participation in the study. We excluded participants with severe auditory impairment or severe dementia (based on medical records and confirmation by an internal medicine doctor). We did not assess cognition as routine.

Data Collection

The study protocol was explained to eligible participants. Written informed consent was obtained from those who were willing to participate in the study. Trained investigators conducted face-to-face interviews with the participants. Data were collected during a period of 10 months, from December 1st, 2021, to September 30th, 2022. Public health doctors evaluated the eligible participants.

Malnutrition Measurement

We used the Mini-Nutritional Assessment Short Form (MNA-SF), a widely used and validated tool, for evaluating nutrition (www.mna-elderly.com).²⁵⁻²⁷ It includes six items: food intake, weight loss over the past 3 months, mobility, psychological stress or acute disease in the past 3 months, neuropsychological problems; and body mass index or calf circumference,²⁵ with a total score ranging from 0 to 14 points. A total score of 0–7 is classified as malnutrition, 8–11 as at risk of malnutrition, and 12–14 as no malnutrition.^{25,28}

Frailty Measurement

Frailty was evaluated using the FRAIL scale,²⁹ including five components: (1) fatigue (tiredness during the previous 4 weeks), (2) resistance (difficulty in walking up 10 steps), (3) ambulation (difficulty in walking 300 m unaided), (4) illness (having ≥ 5 illnesses) and (5) loss of weight ($\geq 5\%$ of weight within 12 months), with the total score of 5. A score ≥ 3 indicates frailty, 1–2 indicates pre-frailty, and 0 indicates robustness. This scale was translated and validated in Vietnamese and has been reported elsewhere.³⁰

Health-Related Quality of Life Measurement

Health-related quality of life was evaluated using the Short-Form 36 questionnaire (SF-36), which includes 36 items covering eight health domains.³¹ Physical functioning (10 items), social functioning (two items), role limitations due to physical problems (four items), role limitations due to emotional problems (three items), mental health (five items), energy and vitality (four items), bodily pain (two items), and general perception of health (five items). The total score ranges from 0 to 100, and a higher score indicates a more favorable health status.³¹ This questionnaire was translated into Vietnamese and validated in a previous study.³²

Other Covariates

Data on other variables were also collected, including demographic information (age, sex, educational level, weight, height, body mass index, and perceived income status), functional status (instrumental activities of daily living and activities of daily living), and chronic diseases. Data on chronic diseases were collected from primary care medical

records. Musculoskeletal diseases included osteoarthritis, osteoporosis, and gout. Chronic pulmonary diseases included asthma, chronic obstructive pulmonary disease, or bronchiectasis.

Instrumental activities of daily living (IADL) were evaluated using the Lawton-Brody scale, which includes eight activities: the ability to use the telephone, ability to go shopping, ability to prepare food, ability to engage in house-keeping, ability to do the laundry, mode of transportation, responsibility for own medications, and ability to handle finances,³³ with a total score ranging from 0 to 8, and a higher score indicating a higher level of independence.³³ Scores below 8 indicated IADL impairment.³³ Activities of daily living (ADL) were evaluated using the Katz Index, including six activities: dressing, bathing, toileting, transferring, feeding, and incontinence.³⁴ Similarly, the total ADL score ranges from 0 to 6, with a higher score indicating a higher level of independence. ADL impairment was defined as a total score of < 6.³⁴

Data Analysis

Categorical variables were expressed as the number of participants (percentage), and quantitative variables were expressed as mean \pm standard deviation (SD). We used chi-squared or Fisher's exact tests to compare categorical variables and one-way analysis of variance or *t*-test to compare continuous variables with normal distribution. The correlation between the SF-36, including eight scales and two summary measures, and the MNA-SF was determined using Pearson's coefficient.

The association between nutritional status and frailty, adjusting for age, sex, ADL, and IADL, was examined by the multinomial logistic regression analysis and expressed as odds ratio (OR) and confidence interval (CI). All statistical analyses were performed using the Stata version 14.0 software (STATA Corp, College Station, Texas). Statistical significance was set at $p < 0.05$.

Results

We approached 635 eligible older adults for participation in the study; however, five of them refused to participate and three were excluded due to missing data (Figure 1). Finally, the study included 627 participants with a mean age of 69 ± 7 years; and 63.6% were female. Kinh and Khmer were the two most popular ethnicities (67.4% and 31.9%, respectively). Buddhism was the most popular religion (64.8%). In particular, most of the participants had low educational attainment (preschool and primary school-educated participants accounted for 78.4%), and one-fourth were former farmers (25.4%). Most of the older adults (89.5%) lived with their family members.

Prevalence of Malnutrition

The prevalence of malnutrition was 7.3% ($n = 46$); however, 50.2% of the study participants ($n = 315$) were at risk of malnutrition. In particular, the number of malnourished individuals increased with age, with more than 30% (30.4%) aged ≥ 80 years. As shown in Table 1, participants with malnutrition had a lower mean body mass index than those without malnutrition (18.9 ± 3.0 vs 25.6 ± 2.7 , $p < 0.001$). In particular, ADL and IADL impairment rates in the malnourished group were significantly higher than those in the non-malnourished group (26.1% vs 8.7% and 47.8% vs 27.4%, respectively).

Association of Malnutrition and Frailty

Table 2 shows the relationship between nutritional status according to the MNA-SF and frailty status. Based on the FRAIL scale, 13.6% ($n = 85$) of participants were classified as frail, 53.4% ($n = 335$) as pre-frail, and 33% ($n = 207$) as non-frail. The frail group's malnutrition rate was twice as high as that of the non-frail group (17% vs 6.3%, $p < 0.001$). Moreover, the proportions of participants whose food intake had declined over the past 3 months and who experienced involuntary weight loss were also significantly greater in the frail group than in the non-frail group (45.9% vs 24.7% and 36.5% vs 20.8%, respectively). In particular, 20 participants who met the criteria of weight loss belonged to both the groups of malnutrition (20/46, 43.5%) and frailty (20/85, 23.5%). The results also showed that the rate of psychological stress or acute disease in the past 3 months was three times higher in frail individuals than in non-frail individuals (52.9% vs 17.9%, $p < 0.001$).

Table 1 Characteristics of Rural Older Adults in Vietnam Classified by Nutritional Status (N = 627)

Characteristics	Overall (N = 627)	Mal-Nutrition (n = 46)	Risk of Malnutrition (n = 315)	No Malnutrition (n = 266)	p-value
Age, mean \pm SD	69 \pm 7	73 \pm 8	70 \pm 6	68 \pm 7	<0.001
Age group, n (%)					<0.001
60–69	347 (55.3)	18 (39.2)	155 (49.2)	174 (65.4)	
70–79	216 (34.5)	14 (30.4)	130 (41.3)	72 (27.1)	
\geq 80	64 (10.2)	14 (30.4)	30 (9.5)	20 (7.5)	
Sex, n (%)					0.396
Female	399 (63.6)	25 (54.4)	203 (64.4)	171 (64.3)	
Male	228 (36.4)	21 (45.6)	112 (35.6)	95 (35.7)	
Ethnic group, n (%)					0.047 ^a
Kinh	423 (67.4)	29 (63.9)	198 (62.9)	196 (73.7)	
Khmer	200 (31.9)	17 (37.8)	115 (36.5)	68 (25.6)	
Chinese	3 (0.5)	0 (0)	1 (0.3)	2 (0.7)	
Others	1 (0.2)	0 (0)	1 (0.3)	0 (0)	
Religion, n (%)					0.906 ^a
Buddhism	406 (64.8)	31 (67.4)	208 (66.0)	167 (52.8)	
Christianity	31 (4.9)	1 (1.2)	17 (5.4)	13 (4.9)	
Non	162 (25.8)	13 (28.2)	75 (23.8)	74 (27.8)	
Others	28 (4.5)	1 (1.2)	15 (4.8)	12 (4.5)	
Education, n (%)					0.004 ^a
Preschool	206 (32.9)	19 (41.3)	116 (36.8)	71 (26.7)	
Primary	285 (45.5)	15 (32.6)	143 (45.4)	127 (47.7)	
Secondary	95 (15.1)	9 (19.6)	46 (14.6)	40 (15)	
High school	36 (5.7)	2 (4.4)	8 (2.6)	26 (9.8)	
Higher education	5 (0.8)	2 (1.1)	2 (0.6)	2 (0.8)	
Marital status, n (%)					0.095 ^a
Never married	24 (3.9)	2 (4.4)	13 (3.5)	11 (4.1)	
Married	456 (72.7)	27 (58.7)	234 (74.3)	195 (73.3)	
Divorced	19 (3)	4 (8.7)	11 (3.5)	4 (1.5)	
Widowed	128 (20.4)	13 (28.2)	59 (18.7)	56 (21.1)	
Living status, n (%)					0.226 ^a
Living alone	59 (9.4)	8 (17.4)	28 (8.8)	23 (8.6)	
With spouse	129 (20.6)	7 (15.2)	73 (23.2)	49 (18.4)	
With children	186 (29.7)	11 (23.9)	92 (29.2)	83 (31.2)	
With spouse and children	246 (39.2)	18 (39.1)	119 (37.8)	109 (41)	
Other	7 (1.1)	2 (4.4)	3 (1)	2 (0.8)	
Perceived economic status, n(%)					0.002
Poverty	36 (5.7)	7 (15.2)	18 (5.7)	11 (4.1)	
Pro-poverty	41 (6.5)	5 (10.9)	27 (8.6)	9 (3.4)	
Non-poverty	550 (87.7)	34 (73.9)	270 (85.7)	246 (92.5)	
Occupation, n (%)					0.268
Famer	159 (25.4)	12 (26.1)	78 (24.8)	69 (25.9)	
Employee	69 (11)	7 (15.2)	37 (11.7)	25 (9.5)	
Officer	21 (3.3)	0 (0)	9 (2.9)	12 (4.5)	
Housewife	247 (39.4)	15 (32.6)	116 (36.8)	116 (43.6)	
Merchant	36 (5.7)	3 (6.5)	18 (5.7)	15 (5.6)	
Other	95 (15.2)	9 (19.6)	57 (18.1)	29 (10.9)	

(Continued)

Table 1 (Continued).

Characteristics	Overall (N = 627)	Mal-Nutrition (n = 46)	Risk of Malnutrition (n = 315)	No Malnutrition (n = 266)	p-value
BMI, kg/m ² , mean ± SD	23.3 ± 3.7	18.9 ± 3	22.1 ± 3.4	25.6 ± 2.7	<0.001
Current smoking, n (%)	114 (18.2)	11 (23.9)	61 (19.4)	42 (15.8)	0.289
Current drinker, n (%)	83 (13.2)	3 (6.5)	35 (11.1)	45 (16.9)	0.053
Comorbidities, n (%)					
Hypertension	262 (41.7)	21 (45.6)	120 (38.1)	121 (45.5)	0.17
Diabetes	56 (8.9)	5 (10.9)	27 (8.6)	24 (9)	0.876
Dementia	75 (11.9)	8 (17.3)	36 (11.4)	31 (11.6)	0.124
Cancer	5 (0.8)	0 (0)	4 (1.3)	1 (0.4)	0.578 ^a
Musculoskeletal disease	126 (20.1)	11 (23.9)	74 (23.5)	41 (15.4)	0.043
Chronic pulmonary diseases	8 (1.3)	1 (2.2)	6 (1.9)	1 (0.4)	0.169 ^a
ADL impairment, n (%)	83 (13.2)	12 (26.1)	48 (15.2)	23 (8.7)	0.002
IADL impairment, n (%)	201 (32.1)	22 (47.8)	106 (33.7)	73 (27.4)	0.016

Notes: The p-value for the difference between age groups was calculated using the independent samples one-way ANOVA for continuous data and the chi-square test for categorical data. ^aNon-parametric test: Fisher's exact test was used.

Abbreviations: ADL, Activities of daily living; BMI, Body mass index; IADL, Instrumental activities of daily living; SD, standard deviation.

Table 2 MNA-SF Item Results Classified by Frailty Status Among Rural Older People in Vietnam (N = 627) © Société des Produits Nestlé SA, Trademark Owners.

MNA-SF Items	Non-Frail (n = 207)	Pre-Frail (n = 335)	Frail (n = 85)	p-value
Food intake declined over the past 3 months				<0.001 ^a
Severe decrease	1 (0.5)	14 (4.2)	9 (10.6)	
Moderate decrease	50 (24.2)	87 (26)	30 (35.3)	
No decrease	156 (75.3)	234 (69.8)	46 (54.1)	
Involuntary weight loss during the last 3 months				0.030 ^a
Weight loss greater than 3 kg	6 (2.9)	12 (3.6)	10 (11.8)	
Does not know	16 (7.7)	23 (6.9)	3 (3.5)	
Weight loss between 1 and 3 kg	37 (17.9)	62 (18.5)	21 (24.7)	
No weight loss	148 (71.5)	238 (71)	51 (60)	
Mobility				<0.001 ^a
Bed or chair bound	0 (0)	1 (0.3)	0 (0)	
Able to get out of bed/chair but does not go out	83 (40.1)	43 (12.8)	32 (37.7)	
Goes out	124 (59.9)	291 (86.9)	53 (62.3)	
Psychological stress in the past three months				<0.001
Yes	37 (17.9)	71 (21.2)	45 (52.9)	
No	170 (82.1)	264 (78.8)	40 (47.1)	
Neuropsychological problem				<0.001 ^a
Severe dementia or depression	0 (0)	2 (0.6)	9 (10.6)	
Mild dementia	26 (12.6)	31 (9.3)	7 (8.2)	
No psychological problems	181 (87.4)	302 (90.1)	69 (81.2)	

(Continued)

Table 2 (Continued).

MNA-SF Items	Non-Frail (n = 207)	Pre-Frail (n = 335)	Frail (n = 85)	p-value
Body mass index (kg/m ²)				0.984
BMI less than 19	25 (12.1)	37 (11.1)	10 (11.8)	
BMI 19 to less than 21	37 (17.9)	53 (15.8)	12 (14.1)	
BMI 22 to less than 23	35 (16.9)	56 (16.7)	15 (17.6)	
BMI 23 to greater	110 (53.1)	189 (56.4)	48 (56.5)	
Calf circumference				0.883
CC less than 31	72 (34.8)	117 (34.9)	32 (37.7)	
CC 31 or greater	135 (65.2)	218 (65.1)	53 (62.3)	
Total score				<0.001
0–7 points: Malnutrition	13 (6.3)	18 (5.4)	15 (17.6)	
8–11 points: At risk of malnutrition	104 (50.2)	160 (47.7)	51 (60)	
12–14 points: No malnutrition	90 (43.5)	157 (46.9)	19 (22.4)	

Notes: The p-value for the difference between age groups was calculated using the chi-square test. ^aNon-parametric test; Fisher's exact tests used. Adapted with permission from Nestlé Nutrition Institute. Mini Nutritional Assessment MNA®. Available from: <https://www.mna-elderly.com/sites/default/files/2021-10/mna-mini-english.pdf>. www.mna-elderly.com. © Société des Produits Nestlé SA 1994, Revision 2009. ^{25–28,35}

Abbreviations: BMI, Body mass index; MNA-SF, Mini Nutritional Assessment Scale Short Form.

Table 3 Multinomial Logistic Regression Analysis of the Nutritional Status and MNA-SF Items Associated with Pre-Frailty/Frailty Among Rural Older Adults in Vietnam (N=627)

	Pre-Frail OR (95% CI)	Frail OR (95% CI)
Nutritional status by MNA-SF		
No Malnutrition	1 (Ref)	1 (Ref)
At risk of malnutrition	0.81 (0.57 – 1.18)	2.14 (1.16 – 3.93)^a
Malnutrition	0.63 (0.29 – 1.29)	4.78 (1.86 – 12.32)^b
MNA-SF items		
No decrease in food intake	1 (Ref)	1 (Ref)
Severe or moderate declined food intake	1.24 (0.83 – 1.86)	2.29 (1.33 – 3.96)^b
No weight loss	1 (Ref)	1 (Ref)
Weight loss >1 kg/month or unknown	0.93 (0.63 – 1.38)	1.53 (0.89 – 2.64)
No impaired mobility (being able to go out)	1 (Ref)	1 (Ref)
Impaired mobility	0.17 (0.10 – 0.27)^c	0.57 (0.32 – 1.03)
No psychological stress	1 (Ref)	1 (Ref)
Psychological stress	1.27 (0.81 – 2.00)	5.45 (3.05 – 9.72)^c
No psychological problems	1 (Ref)	1 (Ref)
Severe or mild neuropsychological problem	0.73 (0.42 – 1.28)	1.47 (0.73 – 2.94)
BMI ≥ 19 kg/m ²	1 (Ref)	1 (Ref)
BMI < 19 kg/m ²	0.79 (0.45 – 1.39)	0.81 (0.35 – 1.86)

Notes: ^ap <0.05, ^bp <0.01, ^cp <0.001. Statistically significant values are in bold font. The model was adjusted for age, sex, ADL, and IADL.

Abbreviations: BMI, body mass index; OR, odds ratio; CI, confidence interval; MNA-SF, Mini Nutritional Assessment Short Form.

In the multinomial logistic regression model assessing the association between nutritional status and frailty, malnutrition, and risk of malnutrition status were independently associated with frailty (Table 3). Individuals at risk of malnutrition had a 2.14 higher odds of frailty (OR = 2.14, 95% CI: 1.16–3.93), which increased to 4.78 (OR = 4.78, 95% CI: 1.86–12.32) in those with malnutrition after adjusting for age, sex, ADL, and IADL. In particular, those with psychological stress or acute disease in the past 3 months had a significantly higher odds ratio of frailty (OR = 5.45, 95% CI: 3.05–9.72) than their counterparts.

Table 4 Correlation Between MNA-SF Score and Health-Related Quality of Life Measured by SF-36 Among Rural Older Adults in Vietnam (N = 627)

	MNA-SF Score	
	r	p
Physical functioning		
Male	0.26	<0.001
Female	0.23	<0.001
Total	0.23	<0.001
Role physical		
Male	0.22	<0.001
Female	0.16	0.001
Total	0.18	<0.001
Bodily Pain		
Male	0.15	0.024
Female	0.19	<0.001
Total	0.17	<0.001
Social functioning		
Male	0	0.988
Female	0.11	0.025
Total	0.07	0.085
Mental health		
Male	0.09	0.187
Female	0.12	0.015
Total	0.11	0.008
Role emotional		
Male	0.16	0.017
Female	0.20	<0.001
Total	0.17	<0.001
Vitality		
Male	0.19	0.004
Female	0.2	<0.001
Total	0.19	<0.001
General Health		
Male	0.33	<0.001
Female	0.25	<0.001
Total	0.27	<0.001

Abbreviations: MNA-SF, Mini Nutritional Assessment Short Form; SF-36, 6-item short-form survey.

Association of Nutritional Status and Health-Related Quality of Life

Table 4 presents the correlation between the MNA-SF and SF-36 scores. Eight domains of the health-related quality of life were positively correlated with the MNA-SF score; two domains, including physical functioning and general health, had a slightly higher correlation with the MNA-SF score than the other domains.

Discussion

Prevalence of Malnutrition

This study aimed to determine the prevalence of malnutrition and its association with frailty and health-related quality of life among older rural adults in Vietnam. Although 7.3% of rural older adults were malnourished, approximately half (50.2%) were at risk of malnutrition. In particular, the prevalence of malnutrition increased with age, with approximately 30% of individuals aged ≥ 80 years experiencing malnutrition. These results indicate that poor nutrition is an alarming

issue for older rural Vietnamese adults. Further, the prevalence of malnutrition in our study was similar to that in a Malaysian study⁶ (7.3% vs 7.5%). However, the prevalence of risk of malnutrition was significantly higher in our study than in the Malaysian study (50.5% vs 23.5%). The prevalence of malnutrition in our study was seven times higher than that reported in a Korean study (7.3% vs 0.8%), whereas the prevalence of risk of malnutrition was nearly four times higher (50.2% vs 13.5%).³⁶ The differences in the prevalence rates may be due to the differences in the socioeconomic status among the countries. First, Vietnamese people, particularly those living in rural areas, have lower incomes than Malaysians and Koreans.³⁷ Meanwhile, income level has been proven to be a strong determinant of nutritional status in older adults. Participants with low income are more likely to be malnourished or at risk of malnutrition.³⁸ Indeed, in our study, approximately 25% of malnourished individuals perceived their financial status as “poverty” or “pro-poverty”. Second, the majority of participants in our study (78.9%) had low educational attainment (preschool/primary school), which was much higher than that in the Korean study (50.9%). Previous studies revealed that older adults with low educational attainment tended to have worse nutritional status due to insufficient knowledge of healthy food selection and a lack of cooking skills.^{39,40} Furthermore, our study participants lived in a rural community, which is also a determinant of malnutrition or risk of malnutrition status. Several reports have shown that the prevalence of malnutrition in rural communities is approximately double that in urban communities because rural older adults have less access to healthcare services, family support, and diverse food options.^{41,42} Therefore, our results indicate the need for screening and early interventions for malnutrition and the risk of malnutrition among rural older Vietnamese adults.

Association of Malnutrition and Frailty

Consistent with previous studies, our study confirms that nutrition is significantly associated with frailty.^{10,36} We found that older adults with malnutrition and risk of malnutrition had 4.78 and 2.14 higher odds of frailty, respectively, than those without malnutrition. Similarly, previous studies in Korea and China reported that older individuals with poor nutritional status had 3.3 and 3.38 higher odds of frailty, respectively, than those with good nutritional status.^{10,36} This result may be explained by the fact that long-term malnutrition may result in fatigue, weight loss, and reduced activity which are components of frailty.²⁹ One interesting finding in our study is that older adults with psychological stress or acute disease in the past 3 months had 5.45 higher odds of frailty than those without psychological stress and acute disease. These two conditions directly impact mental health and frailty, leading to decreased food intake, reduced mobility and physical activity, and a lack of engagement in social relationships.⁴³ Therefore, older people with acute disease or psychological stress should be recognized as high-risk individuals for frailty.

Association of Nutritional Status and Health-Related Quality of Life

Health-related quality of life is an essential measure of health outcomes in older adults.⁴⁴ In our study, the MNA-SF score was positively correlated with eight domains of health-related quality of life measured by SF-36, particularly physical functioning and general health. Older individuals with good nutritional status had a higher quality of life. These results align with those of previous studies, which suggested that malnutrition predicted declining quality of life among older adults.^{45,46} A possible explanation for this is that food intake and nutrition are related to cultural and social aspects of eating and life satisfaction, a part of the quality of life.⁴⁵ Therefore, older adults with good nutritional status are expected to experience a better quality of life than those with poor nutrition. This result emphasizes the need to improve the nutritional status of older rural adults to improve their quality of life.

To the best of our knowledge, this is the first study addressing nutritional status among rural older adults living in a community in Vietnam. It provides a clear understanding of malnutrition and risk of malnutrition status and their association with frailty and quality of life among older people in a lower-middle-income country. However, our study has some limitations. First, this was a cross-sectional study; hence, it could not identify the causal relationship between malnutrition and frailty and health-related quality of life. Second, the data may not be nationally representative because our study was limited to a rural province in Vietnam and we may have a selection bias because we did not recruit participants who did not register to primary care. These would be fruitful areas for future research with larger sample sizes and diverse populations in Vietnam. Moreover, our study used overlapping diagnostic criteria for malnutrition (based on MNA-SF) and frailty (based on the FRAIL scale). Approximately 45% of the malnourished individuals had

weight loss, accounting for 25% of the frail group. Therefore, our study may have overestimated the association between malnutrition and frailty.

Conclusion

Malnutrition and the risk of malnutrition were significantly higher among older adults living in the community, particularly in those aged ≥ 80 years in an agricultural province in Vietnam. Older individuals with malnutrition had approximately five-fold higher odds of frailty than those without malnutrition. Those with psychological stress or acute disease in the past 3 months had a greater risk of frailty than those without. Furthermore, nutritional status was positively correlated with the health-related quality of life among older rural Vietnamese adults. Therefore, there is a need for screening older rural adults for malnutrition and risk of malnutrition since they lack access to health services, and as nutrition may receive little attention from healthcare providers. In particular, further interventional studies are needed to explore whether early nutritional interventions may reduce the risk of frailty and increase the quality of life among older adults in rural areas.

Ethics Approval and Informed Consent

The study was approved by the Institutional Review Board of the University of Medicine and Pharmacy at Ho Chi Minh City (Approval number: 26/HĐĐĐ-ĐHYD). Written informed consent was obtained from the participants in the study.

Disclosure

The authors report no conflicts of interest in this work.

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