

Original Article

Frailty and Multimorbidity Among Community-Dwelling Older People in Vietnam

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Received 22 February 2021

Accepted 27 May 2021

Keywords

Frailty, multimorbidity, older
 people.

ABSTRACT

Background/Purpose: This study aimed to identify the prevalence of frailty and multimorbidity, as well as their interrelationship, among community-dwelling older people in Vietnam.

Methods: This cross-sectional study involved face-to-face interviews with community-dwelling older people who living in Ho Chi Minh City. Frailty was assessed according to Fried's criteria, and multimorbidity was defined as the coexistence of ≥ 2 chronic diseases.

Results: The study included 598 participants (mean age: 71.2 ± 7.8 years, 67.2% female). The prevalence of multimorbidity was 55.5%. The prevalence of frailty was 18.1%, was significantly higher among participants with multimorbidity (multimorbidity: 23.1% vs. no multimorbidity: 11.5%, $p < 0.001$). Multivariate analysis revealed that multimorbidity was an independent factor that associated with frailty (adjusted odds ratio: 1.92, 95% confidence interval: 1.17-3.17, $p = 0.010$).

Conclusion: The prevalences of frailty and multimorbidity were very high among community-dwelling older people in Vietnam. Furthermore, multimorbidity was an independent factor that associated with frailty. Therefore, early health interventions are needed to prevent and manage both frailty and multimorbidity in this vulnerable population.

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1. INTRODUCTION

Aging is associated with the development of multiple chronic conditions, and the prevalence of multimorbidity increases from approximately 62% among individuals aged 65-74 years to approximately 82% among those who aged ≥ 85 years.¹ Chronic diseases are considered a predictor of frailty,² which is an age-related syndrome of physiological decline, that is characterized by marked vulnerability to adverse health outcomes such as infection, injury,

and hospitalization.³ Frailty and multimorbidity have a bidirectional relationship,⁴ with frailty potentially originating from the existence of comorbidities and also predisposing older adults to multimorbidity.³ According to Rockwood's concept, frailty involved the accumulation of multiple deficits, including chronic diseases.² Moreover, both frailty and multimorbidity are associated with increased risks of hospitalization, mortality, and disabilities.⁵

Previous studies have suggested that, in Vietnam,

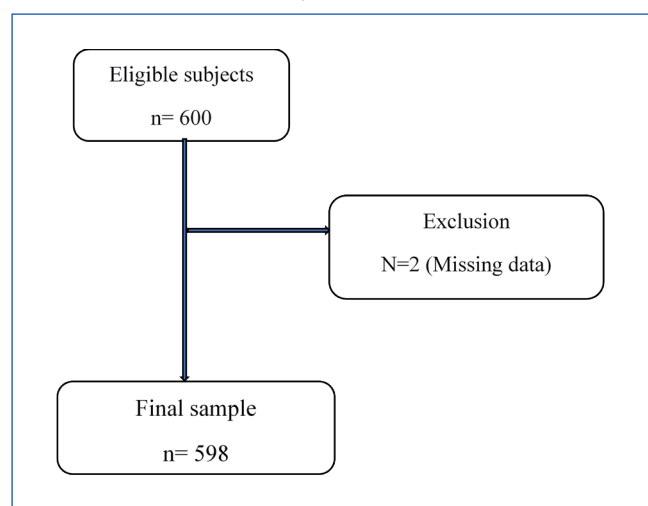
the prevalences of frailty and multimorbidity were 31.9%⁶ and 19%⁷, respectively. However, we could not find any studies that evaluated and reported the relationship between multimorbidity and frailty among older adults in Vietnam. Understanding the prevalences of frailty and multimorbidity, as well as their relationship, may help guide the development of specific health-care programs that can help reduce hospitalization and disability in this population. Therefore, in this study, we aimed to identify the prevalence of frailty and multimorbidity, as well as their relationship among community-dwelling older adults in Vietnam.

2. METHODS

2.1. Study Design and Participants

A cross-sectional study was conducted in an urban area (District Eight) of Ho Chi Minh City, which is the most populous city in Vietnam with approximately 28,000 inhabitants. The inclusion criteria were: older adults (age ≥ 60 years) who had resided in the district for ≥ 1 year, were able to communicate, and were able to walk for 5 m. The exclusion criteria were severe visual or auditory impairment, knee stiffness, balance, and walking disorders, or inability to walk for 4.5 m. A cluster sampling scheme was used in the study and 20 clusters with 30 people per cluster, were chosen. The eligible participants were evaluated at their homes by the investigators. Finally, 600 eligible participants from 16 sub-districts were invited to participate in the study; two participants were excluded because of missing data; none of those individuals refused to participate in this study (Figure 1). The study protocol was approved by the ethics committee of the University of Medicine and Pharmacy at Ho Chi Minh City and all participants provided written informed consent. The data were collected during a 6-month period between October 2016 and April 2017.

Figure 1. Flowchart of the study participant selection process



2.2. Procedures

Data were collected using structured questionnaires during face-to-face interviews as well as testing at the participant's home. All interviews and tests were administered by a geriatrician and two nurses. The participants were interviewed and performed tests at home.

Multimorbidity was defined as the coexistence of ≥ 2 chronic diseases.¹ Polypharmacy was defined as the concurrence use of ≥ 5 types of drug.⁸ Frailty was evaluated according to Fried's phenotype using five criteria³: unintentional weight loss, exhaustion, weakness, slowness, and low physical activity. Unintentional weight loss was defined as a weight decrease of ≥ 4.5 kg or $\geq 5\%$ within 1 year, although the participant's self-reported estimation was acceptable if objective measurements were unavailable. Exhaustion was assessed using two statements from the Center for Epidemiologic Studies Depression (CES-D) scale ("I felt that everything I did required effort during the last week" and "I could not get going during last week"), was considered present if the participant responded to either statement using the options "a moderate amount of time: 3 to 4 days" or "most of the time". Weakness was evaluated based on grip strength, which was assessed using a Jamar hydraulic hand dynamometer (model 5030J1). The average value was calculated from three repetitions of the task while the participants used their dominant hand in a seated position and with the forearm perpendicular to the arm. Weakness was identified when the average grip strength was in the lowest 20% of the sex and body mass index (BMI)-stratified values (women: ≤ 9.46 kg for BMI of < 18.5 kg/m², ≤ 11 kg for BMI of 18.5-22.9 kg/m², ≤ 10.67 kg for BMI of 23-24.9 kg/m², ≤ 11.06 kg for BMI of ≥ 25 kg/m²; men: ≤ 14.67 kg for BMI of < 18.5 kg/m², ≤ 18.67 kg for BMI of 18.5-22.9 kg/m², ≤ 18.53 kg for BMI of 23-24.9, and ≤ 19.06 kg for BMI of ≥ 25 kg/m²). Walking speed was evaluated by walking a distance of 4.6 m at the participant's usual speed. Slowness was identified when the walking speed was in the highest 20% of the sex-and height-stratified values (female: ≥ 11.7 s for a height of < 150 cm or ≥ 10.5 s for a height of ≥ 150 cm; male: ≥ 9.9 s for a height of < 159 cm or ≥ 9.37 s for a height of ≥ 159 cm). Physical activity was measured by kilocalories expended per week during the last two weeks using 18 activities that were adapted to Vietnamese culture (walking, stair climbing, rock or mountain climbing, bicycling, dancing, running, sailing, weight lifting, swimming, tennis playing, volleyball, bowling, badminton, basketball, golf, painting, gardening, and housework). The energy calculation was based on the 2011 compendium of Physical activities⁹ and low physical activity was defined as energy expenditure in the lowest 20% of the sex-stratified values (female ≤ 245 kcal/week, male ≤ 231 kcal/week).

Information regarding chronic diseases was collected from the participant's medical records. In addition, data were collected regarding BMI, education, and marital status. A low BMI was defined as a value of $<18.5 \text{ kg/m}^2$ based on a previous report.¹⁰ Low education was defined as not having graduated from secondary school. Single/widowed status was indicated as a person who had not been married, had been divorced, or whose partner had died. Impairment of instrumental activities of daily living was defined as the need for assistance to perform shopping, housekeeping, washing, accounting, food preparation, medicine management, using a telephone, or using transportation.¹¹ Impairment of activities of daily living was defined as the need for assistance to get dressed, ambulate, eat, maintain hygiene, and used the toilet (or based on incontinence).¹²

2.3. Statistical Analysis

All data were analyzed using Statistical Product and Service Solutions (SPSS) software (version 16.0; IBM Corp., Armonk, NY, USA). The characteristics of participants were summarized by frailty status with means \pm standard deviation (SD) for continuous variables, and numbers with percentages for categorical variables. Categorical variables were compared using the chi-square test or Fisher's exact test for small sample sizes. For the association of frailty and multimorbidity, univariate and multivariable logistic regression analyses were performed. Odds ratios (ORs) and 95% confidence intervals (CIs) were calculated. If the tests showed a probability of less than or equal to 5% ($p < 0.05$), the variable would be included in the multivariate analysis. Moreover, if the covariate such as gender was proved to have a significant relationship with frailty in the literature would be added in multivariable logistic analysis. The probability of ≤ 0.05 was considered as statistical significance.

3. RESULTS

The study included 598 participants (67.2% female) and the mean \pm SD age in this population was 71.2 ± 7.8 years (range: 60-97 years).

Approximately 75% and 33% of the participants had low education and impairment of instrumental activities of daily living, respectively (Table 1).

3.1. Prevalences of Frailty and Multimorbidity

The prevalence of frailty was 18.1% among all participants, and the prevalence was significantly higher among participants with multimorbidity (multimorbidity: 23.4% vs. no multimorbidity: 11.5%, $p < 0.001$). The most prevalent components were weakness (41.3%) and slowness (27.4%). The prevalence of frailty and multimorbidity are presented according to gender and age group in Table 2. There was no significant gender-based difference in the prevalence of frailty ($p = 0.587$). However, frailty was significantly more common among individuals who were in the age group of 80-89 years (47.2%).

The prevalence of multimorbidity was significantly higher among frail individuals than among non-frail individuals (71.3% vs. 28.7%, $p < 0.001$). Furthermore, the prevalence of multimorbidity was significantly higher among females than among males (58.2% vs. 48.5%, $p = 0.024$). Hypertension was the most prevalent condition (57.7%), which was followed by

Table 1. General characteristics of the participants

	All (n=598)	Frail participants (n=108)	Non-Frail participants (n=490)	p
	N	N (%)	N (%)	
Age, years (mean \pm SD)	71.24 \pm 7.76	76.96 \pm 8.45	69.98 \pm 7.01	<0.001
Female gender	402	75 (18.7)	327 (81.3)	0.587
Low education	419	92 (22)	327 (78)	<0.001
Living alone	27	4 (14.8)	23 (85.2)	0.802 ^a
Single/widowed/divorced	266	64 (24.1)	202 (75.9)	0.001
BMI $<18.5 \text{ kg/m}^2$	58	21 (36.2)	37 (63.8)	<0.001
Multimorbidity	329	77 (23.4)	252 (76.6)	<0.001
Polypharmacy	164	39 (23.8)	125 (76.2)	0.025
Hospitalization during the previous year	97	39 (40.2)	58 (59.8)	<0.001
IADL impairment	236	93 (39.4)	143 (60.6)	<0.001
ADL impairment	28	22 (78.6)	6 (21.4)	<0.001
Chronic diseases				
Hypertension	345	74 (21.5)	271 (78.5)	0.012
Ischemic heart disease	106	24 (22.6)	82 (77.4)	0.176
Heart failure	21	8 (38.1)	13 (61.9)	0.037 ^a
Stroke	18	9 (50)	9 (50)	0.002 ^a
Dementia	126	47 (37.3)	79 (62.7)	<0.001
Parkinson	4	1 (25)	3 (75)	0.550 ^a
Diabetes	119	26 (21.8)	93 (78.2)	0.230
Osteoarthritis	197	43 (21.8)	154 (78.2)	0.093
COPD	22	7 (31.8)	15 (68.2)	0.094 ^a

Most p-values were calculated using the chi-square test, although Fisher's-exact test was used where indicated by a superscripted ^a.

Abbreviations: ADL, activities of daily living; BMI, body mass index; COPD, chronic obstructive pulmonary disease; IADL, instrumental activities of daily living.

osteoarthritis (32.9%), and dementia (21.1%).

3.2. Frailty and Multimorbidity Association

Approximately 23% of older people with multimorbidity were also considered frail. The univariate logistic regression analysis revealed that multimorbidity had a positive association with frailty (OR:2.34, 95% CI: 1.41-3.69, $p < 0.001$) (Table 2). This association remained significant after adjusting for age, gender, low BMI, low education, and marital status (OR:1.92, 95% CI: 1.17-3.17, $p = 0.010$) (Table 3).

4. DISCUSSION

This study of 598 older adults in an urban area of Vietnam revealed high prevalences of frailty (18.1%) and multimorbidity (55.5%), with 60.2% of the participants either being frail or having multimorbidity. The prevalence of frailty in this study was higher than the prevalence reported in some studies in European countries (12%)¹³ or Japan (9.3%),¹⁴ although the prevalences herein agree with the prevalences reported in Southeast Asian countries such as Malaysia (18.3%)¹⁵ and Thailand (17.2%).¹⁶ This gap in prevalences of frailty may be attributed to the differences in eco-social status and lifestyle among high-income and low-middle-income countries. In Japan or European countries, older people tend to become involved in social activities and receive better preventive disease care than older people in Vietnam or some Southeast Asian countries. Therefore, older people in high-income countries have a lower risk of frailty. Compared to a previous study in Vietnam,⁶ the prevalence of frailty in our study is significantly lower (30% vs. 18.1%). This is because the earlier study was conducted in a hospital, and the participants were inpatients with acute conditions who had a higher risk of frailty than community-dwelling older people.

The prevalence of frailty increased significantly with age and was highest in the age group of 80-89 years (47.2%), significantly differed statistically from the prevalence in the two younger age groups ($p < 0.001$), which is also consistent with older age being a risk

factor for frailty in previous studies.^{2,3,17} Interestingly, we observed that frailty was unassociated with gender, which conflicts with previous reports that females have a higher risk of frailty,^{18,19} although other Asian studies^{15,17} have also indicated that gender was not associated with frailty. Thus, the discrepancy between

Table 3. Univariate logistic regression of factors that might be associated with frailty

Factors	Unadjusted odds ratio for frailty	95% CI	<i>p</i>
Age, years	1.12	1.09-1.15	<0.001
Female gender (reference: male)	1.13	0.72-1.77	0.587
Low education (reference: no)	2.86	1.63-5.03	<0.001
Living alone (reference: no)	0.78	0.26-2.31	0.645
Single/widowed/divorced (reference: having a partner)	2.07	1.36-3.12	0.001
BMI <18.5 kg/m ² (reference: no)	2.95	1.65-5.29	<0.001
Multimorbidity (reference: no)	2.35	1.49-3.69	<0.001
Polypharmacy (reference: no)	1.65	1.06-2.57	0.026
Hospitalization during the previous year (reference: no)	4.20	2.60-6.78	<0.001

Abbreviation: BMI, body mass index.

Table 4. Multivariable logistic regression analysis of factors that might be associated with frailty

Significant covariates	Adjusted OR (95%CI)	<i>p</i>
Age (year)	1.11 (1.07-1.14)	<0.001
Female sex (reference: male)	0.95 (0.54-1.69)	0.867
Single/widowed/divorced (reference: having a partner)	1.41 (0.45-4.46)	0.553
Low education (reference: no)	2.04 (1.08-3.86)	0.028
Low BMI (<18 kg/m ²) (reference: no)	3.52 (1.79-6.95)	<0.001
Multimorbidity (reference: no)	1.92 (1.17-3.17)	0.010

The multivariable model was adjusted for age, sex, marital status, education status, and BMI.
Abbreviations: BMI, body mass index; CI, confidence interval; OR, odds ratio.

Table 2. Prevalence of frailty and multimorbidity calculated by gender and age group

Factor	Gender		<i>p</i>	Age group, years			<i>p</i>
	Female (n=402) N (%)	Male (n=196) N (%)		60-69 (n=296) N (%)	70-79 N (%)	≥80 N (%)	
Frailty status							
Non-frail (0-2 criteria)	327 (81.3)	163 (83.2)	0.587	271 (91.9)	161 (83)	57 (52.8)	<0.001
Frail (≥3 criteria)	75 (18.7)	33 (16.8)		24 (8.1)	33 (17)	51 (47.2)	
Multimorbidity							
Yes	234 (58.2)	95 (48.5)	0.025	135 (45.6)	121 (62.4)	73 (67.6)	<0.001
No	168 (41.8)	101 (51.5)		161 (54.4)	73 (37.6)	35 (32.4)	

Chi-square tests were used in the analysis.

our findings and previous findings regarding gender and frailty may be related to ethnic differences. We found that the prevalence of multimorbidity was 55.5%, whereas other studies have revealed prevalences ranging from 33.1%²⁰ to 67%,²¹ which increased with age. These differences may be related to the differences in the number of chronic conditions and the data sources that were collected, as well as the lack of a standard definition of multimorbidity.²² Our results suggest that multimorbidity may be related to gender among older Vietnamese individuals whereas the prevalences of pre-frailty and frailty were similar in Vietnamese females and males. The high prevalence of frailty and multimorbidity indicates that these conditions are major health indicators among Vietnamese older adults. Furthermore, we observed a high percentage of pre-frailty (46.8%), which is an important predictor of frailty and can be potentially modified via early intervention.

The multivariable analysis revealed that multimorbidity was an independent factor that associated with frailty (adjusted OR: 1.92, 95% CI: 1.17-3.17, $p=0.010$). Moreover, frail individuals tended to have more comorbidities; approximately 71% of frail individuals had ≥ 2 chronic diseases, which agrees with previously reported findings.²³ Chronic diseases may play an important role in the pathophysiology of frailty, which involves the accumulation of chronic conditions.²⁴ Furthermore, people with multimorbidity have increased risks of polypharmacy,²⁵ falls,²⁶ and hospitalization,²⁷ which are considered to be the main risk factors for frailty.^{3,15} Therefore, frailty and multimorbidity are interrelated conditions.⁴ Our study provides important evidence regarding these two important health conditions among community-dwelling older Vietnamese adults (≥ 60 years old); approximately 60% were frail or had multimorbidity, and approximately 45% were considered pre-frail. Although frailty and multimorbidity were strongly associated, approximately 30% of frail subjects did not have multimorbidity and approximately 75% of subjects with multimorbidity were considered non-frail. Therefore, our findings suggest that frailty screening and preventive measures should be implemented for individuals with multimorbidity, which may help reduce the related adverse health outcomes, such as economic burden, disability and mortality.

4.1. Strengths and Limitations

To the best of our knowledge, this is the first community-based study of frailty and multimorbidity in an urban area of Vietnam. Furthermore, the results were strengthened by identified frailty according to Fried's phenotype and objective measurement of muscle using a standard hydraulic hand dynamometer. However, this study also has several limitations. First, the sample is not nationally representative and further

confirmation of the results is needed in a larger study. Second, the participants' chronic diseases were identified using their health records and there is a possibility that the prevalence of multimorbidity was underestimated.

5. CONCLUSION

Frailty and multimorbidity were prevalent among the community-dwelling older adults in an urban area of Vietnam. Furthermore, multimorbidity was independently associated with an increased risk of frailty. Therefore, early healthcare interventions are needed to prevent and manage frailty and multimorbidity in this population.

CONFLICTS OF INTEREST

All of the contributing authors declare that they have no conflict of interest.

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