Malaysian Family Physician
Official Journal of the Academy of Family Physicians of Malaysia
and Family Medicine Specialist Association of Malaysia

ORIGINAL ARTICLE

Demographic and cardiovascular risk factors associated with pre-frailty and frailty among community-dwelling older adults in Jakarta, Indonesia: Active Aging Study

Yvonne Suzy Handajani, Yuda Turana, Nelly Tina Widjaja, Antoninus Hengky

Handajani YS, Turana Y, Widjaja NT, Hengky A. Demographic and cardiovascular risk factors associated with pre-frailty and frailty among community-dwelling older adults in Jakarta, Indonesia: Active Aging Study. *Malays Fam Physician.* 2023;18:36. https://doi.org/10.51866/oa.267

Keywords:
Frailty, Elderly, Ageing, Cardiovascular diseases, Exercise, Indonesia

Authors:

Yvonne Suzy Handajani
(Corresponding author)
Prof (Geriatrics & Gerontology), MPH, Ph.D
Department of Public Health and Nutrition, School of Medicine and Health Science, Atma Jaya Catholic University of Indonesia, Jl. Pluit Raya No. 2, Penjaringan, Jakarta Utara, Indonesia.
Email: yvonne.hand@atmajaya.ac.id

Yuda Turana
Prof (Neurology), MD, Ph.D
Department of Neurology, School of Medicine and Health Science, Atma Jaya Catholic University of Indonesia Jl. Pluit Raya No. 2, Penjaringan, Jakarta Utara, Indonesia.

Nelly Tina Widjaja
MD, MPH
Department of Public Health and Nutrition, School of Medicine and Health Science, Atma Jaya Catholic University of Indonesia, Jl. Pluit Raya No. 2, Penjaringan, Jakarta Utara Indonesia.

Abstract

Introduction: This study aimed to evaluate the prevalence of frailty and its determinants, especially in relation to chronic disease and lifestyle among elderly individuals.

Methods: A cross-sectional study was conducted among 278 individuals aged 60 years and over living in Jakarta. All participants underwent assessment, including medical history-taking, physical examination and blood tests for the sugar level and lipid profile. Frailty was assessed using the Frailty Instrument for Primary Care of the Survey of Health, Ageing and Retirement in Europe. All data were analysed using the chi-square test and multinomial logistic regression analysis.

Results: The prevalence of pre-frailty and frailty among the older adults was 40.6% and 28.8%, respectively. Female sex, lack of exercise, presence of cardiovascular diseases and high low-density lipoprotein cholesterol (LDL-C) level were associated with pre-frailty and frailty. Education for <9 years was associated only with frailty. After adjustments for all covariates, female sex (adjusted odds ratio [AOR]=1.96, 95% confidence interval [CI]=1.07–3.60; AOR=3.93, 95% CI=1.87–8.24), lack of exercise (AOR=14.81, 95% CI=5.07–43.26; AOR=49.48, 95% CI=16.20–151.09) and presence of cardiovascular diseases (AOR=5.32, 95% CI=1.40–19.20; AOR=6.06, 95% CI=1.63–22.56) were associated with pre-frailty and frailty. Meanwhile, education for <9 years (AOR=1.97, 95% CI=1.05–3.69) and high LDL-C level (AOR=3.52, 95% CI=1.14–10.88) were associated with frailty.

Conclusion: Exercise, early screening and intervention for cardiovascular diseases and maintenance of lower LDL-C levels may prevent and slow the progression of frailty.

Introduction

The world's population has grown rapidly over the last 60 years. Between 2015 and 2050, it has been projected that the proportion of individuals aged 60 years or over will nearly double from 12% to 22%.[1] Indonesia has the eighth largest elderly population in the world and the fourth largest elderly population among Asian countries.[2] According to the Central Bureau of Indonesia, there were 25.82 million elderly individuals (9.92%) in Indonesia in 2020.[3]

Frailty is a major problem among elderly Indonesians. This modern geriatric syndrome is closely related to a high risk for devastating conditions, such as falls, hospitalisation, disability and death.[4] Pre-frailty is the prodromal stage of frailty, a condition that could be reversed, thus preventing the onset of frailty.[5] The prevalence of frailty and pre-frailty in individuals aged 60 years and over in low- and middle-income countries is 17.4% and 49.3%, respectively.[6] There is scant information on the prevalence of frailty, particularly in lower-to-middle-income countries, such as Indonesia. In a study of 448 geriatric clinic patients aged 65 years and over in Indonesia, 25.2% have been found to be frail.[7] There is much research on frailty in other countries, especially developed countries, but there is limited research in Indonesia, which has the largest population of older adults in Southeast Asia.

Frailty is a syndrome involving biological, psychological and social factors that reduce the physiological reserves, resulting in vulnerability when facing stressors and poor outcomes, such as disability, dependency, hospitalisation and mortality.[5-7]

Specific care plans for patients with frailty have

Antoninus Hengky
MD
Center of Health Research, School of Medicine and Health Science, Atma Jaya Catholic University of Indonesia
Jl. Pluit Raya No. 2, Penjaringan, Jakarta Utara, Indonesia.

not yet been extensively developed and tested, so no effective interventions are implemented once frailty is detected. Identifying the factors associated with frailty in older adults may promote healthy ageing with a lower level of frailty. Previous studies have shown the association of frailty with age, ethnicity, residential status, marital status, health status, physical activity, functional disability, nutritional status, memory impairment, multimorbidity, poor lifestyle, depression, smoking and alcohol use.[5-7]

This study aimed to evaluate the prevalence of frailty and its determinants, especially in relation to chronic disease and lifestyle among elderly individuals.

Methods

Setting and study population

This investigation was a cross-sectional study that evaluated 278 individuals aged ≥60 years living in Jakarta, Indonesia. We identified the participants from the population through the local district office. The participants were notified around 1 week before interviews began and were asked for informed consent on the interview day. Trained interviewers visited the participants in the sub-district office after obtaining informed consent. We followed the methods of Mikel Izequierdo et al.[8] regarding the assessment of independent variables, including exercise. We used the G*Power 3.1.9.7 software (Heinrich Heine University Düsseldorf, Germany) for calculating the sample size.[9] The minimal sample size that needed to be obtained to reach the power of 90% was 250 participants.

All participants underwent a standardised structural clinical examination and assessment, including medical history-taking, physical examination and blood tests for the sugar level and lipid profile (total cholesterol, triglyceride, low-density lipoprotein cholesterol [LDL-C] and high-density lipoprotein cholesterol [HDL-C] levels). The participants were asked for their age, sex (male and female), highest education attained and smoking status. Age was grouped into <65 and ≥65 years. Educational status was grouped into low and high education with a cut-off of ≥9 years of education for high educational status because 9 years of education is the minimal education standard set by the Indonesian government. The smoking status was classified into non-smoker and smoker. The participants were also asked whether they had been diagnosed by a healthcare professional with hypertension, diabetes or cardiovascular diseases (myocardial infarction, coronary heart disease and heart failure). Exercising was defined as performing exercises for a minimum period of 30 min for 3 days a week. The body mass index (BMI) was calculated using height in metre squared and body weight in kilogram; the participants were classified as having obesity when the BMI was ≥25 kg/m^2 according to the World Health Organization guidelines for Asia Pacific populations.10 The total cholesterol, triglyceride and LDL-C levels were considered high when the values were higher than 200, 150 and 130 mg/dL, respectively. The HDL-C level was considered low when it was less than 40 mg/dL for men and 50 mg/dL for women.

Frailty was assessed using the Frailty Instrument for Primary Care of the Survey of Health, Ageing and Retirement in Europe (SHARE-FI).11 The SHARE-FI consists of several variables, including exhaustion, weight loss, weakness, slowness and low activity. Exhaustion is assessed using the following question: 'In the last month, have you had too little energy to do the things you wanted to do?' A score of 1 is assigned if the answer is 'yes' and 0 if the answer is 'no'. Weight loss is assessed using the following question: 'What has your appetite been like?' A score of 1 is assigned if the answers are 'diminution in desire for food' or 'less than usual' and 0 if the answer is 'absent'. Weakness is assessed on the basis of the handgrip strength measured using a dynamometer. The higher value between the two consecutive measurements of both hands is included and kept continuous. Slowness is defined as a positive answer to the following questions: 'Do you have difficulty walking 100 m?' or 'do you have difficulty climbing one flight of stairs without resting?' A score of 1 is given if the answer is 'yes' and 0 if the answer is 'no'. Low activity is assessed using the following question: 'How often do you engage in low or moderate physical activity, such as gardening, cleaning or going for a walk?' A score of 1 is given if the answer is 'more than once a week'; 2, 'once a week'; 3, 'one to three times a month'; and 4, 'hardly ever or never'. All scores obtained from these five criteria were calculated using the formula by Romero-Ortuno et al. to determine the classification of non-frail, pre-frail and frail.[12]

Statistical analysis

The participant characteristics were analysed and compared using the chi-square test for bivariate analysis. The associations between the dependent and independent variables

were evaluated using a multinomial logistic regression analysis. The data were also analysed by adjusting for age, sex, educational level and all covariates. The analysed data were presented with P-values, wherein P<0.05 was considered significant, and 95% confidence intervals (CIs). The analyses were conducted using the IBM SPSS software version 22 (IBM, New York, USA).

Results

Characteristics of the respondents

Table 1 summarises the characteristics of the respondents according to their frailty status. A total of 278 individuals were recruited for this study. Among them, 30.6% were robust; 40.6% were pre-frail; and 28.8% were frail. The mean age was 68 years, and more than half (52.2%) had <9 years of formal education. The majority of the participants were women (68.8%). Approximately 14.4% were smokers, and around two thirds (60.8%) performed exercises. According to chronic conditions, more than half of the participants (55.4%) had hypertension; one third (32.8%) had diabetes; and 12.9% had cardiovascular diseases. Moreover, the majority were found to have high total cholesterol (59.7%) and LDL-C levels (55.7%). High triglyceride and low HDL-C levels were measured in 24.1% and 25.5% of the total population, respectively. The bivariate analysis showed that sex, exercise, cardiovascular disease and LDL-C level were significantly associated with pre-frailty and frailty (P<0.05). The educational level was associated only with frailty.

Table 1. Characteristics of the older adults according to the frailty status.

Variables	Total (N=278)	Non-frail (n=85)	Pre-frail (n=113)	Frail (n=80)	χ^2	P-value
Age						
≤65 years	127 (45.7)	40 (47.1)	51 (45.1)	36 (45.0)	0.09	0.954
>65 years	151 (54.3)	45 (52.9)	62 (54.9)	44 (55.0)		
Sex						
Male	87 (31.3)	38 (44.7)	35 (31.0)	14 (17.5)	14.20	0.001
Female	191 (68.7)	47 (55.3)	78 (69.0)	66 (82.5)		
Education						
≥9 years	133 (47.8)	44 (51.8)	60 (53.1)	29 (36.3)	6.09	0.048
<9 years	145 (52.2)	41 (48.2)	53 (46.9)	51 (63.7)		
Smoking status						
Non-smoker	238 (85.6)	68 (80.0)	98 (86.7)	72 (90.0)	3.54	0.171
Smoker	40 (14.4)	17 (20.0)	15 (13.3)	8 (10.0)		
Exercise						
Yes	169 (57.0)	81 (95.3)	65 (57.5)	23 (28.8)	72.42	<0.001
No	109 (39.2)	4 (4.7)	48 (42.5)	57 (71.2)		
Body Mass Index						
Normal	159 (57.0)	48 (56.5)	69 (61.1)	42 (51.9)	1.61	0.447
Obesity	119 (43.0)	37 (43.5)	44 (38.9)	38 (48.1)		
Diabetes						
No	186 (67.1)	55 (64.7)	81 (71.7)	50 (63.3)	1.85	0.403
Yes	91 (32.9)	30 (35.3)	32 (28.3)	29 (36.7)		
Hypertension						
No	222 (79.9)	69 (81.2)	92 (81.4)	61 (76.3)	0.91	0.635
Yes	56 (20.1)	16 (18.8)	21 (18.6)	19 (23.8)		
Cardiovascular diseases						
No	242 (87.1)	82 (96.5)	95 (84.1)	65 (81.3)	9.96	0.007
Yes	36 (12.9)	3 (3.5)	18 (15.9)	15 (18.7)		
Total cholesterol level						
Normal	110 (39.9)	29 (34.1)	49 (43.4)	32 (41.0)	1.79	0.408
High	166 (60.1)	56 (65.9)	64 (56.6)	46 (59.0)		
LDL-C level						
Normal	123 (44.2)	28 (32.9)	55 (48.7)	40 (50.0)	6.37	0.041
High	155 (55.8)	57 (67.1)	58 (51.3)	40 (50.0)		
HDL-C level						
Normal	207 (74.5)	60 (70.6)	89 (78.8)	58 (72.5)	1.93	4.381
Low	71 (25.5)	25 (29.4)	24 (21.2)	22 (27.5)		
Triglyceride level						
Normal	209 (75.7)	63 (74.1)	86 (76.1)	60 (76.9)	0.19	0.910
High	67 (24.3)	22 (25.9)	27 (23.9)	18 (23.1)		

LDL-C, Low Density Lipoprotein Cholesterol; HDL-C, High Density Lipoprotein Cholesterol.

Associated factors of pre-frailty and frailty

The multivariate analyses showed that pre-frailty and frailty were significantly associated with sex, exercise, cardiovascular diseases and LDL-C level, while only frailty was associated with educational level.

The female participants were 1.96 times (95% CI=1.07–3.60) more likely to be pre-frail than their counterparts; meanwhile, the participants who did not exercise regularly and who had cardiovascular diseases were 14.80 (95% CI=5.07–43.26) and 5.32 times (95% CI=1.40–19.20) more likely to be pre-frail than their counterparts, respectively (**Table 2**).

Table 2. Association of the determinants with the pre-frailty and frailty status among the older adults.

Variables	Category	Unadjusted OR (95% CI)	Age-, sex- and education-adjusted OR (95% CI)	All covariate-adjusted OR (95% CI)
Age	Non-frail Pre-frail Frail	Ref 0.92 (0.53–1.63) 0.90 (0.50–1.70)	Ref 0.87 (0.49–1.54) 0.82 (0.43–1.54)	Ref 0.95 (0.54–1.69) 0.91 (0.49–1.70)
Sex	Non-frail Pre-frail Frail	Ref 1.80 1.01–3.23)* 3.81 (1.86–7.81)**	Ref 1.89 (1.04–3.45)* 3.56 (1.71–7.42)**	Ref 1.96 (1.07–3.60)* 3.93 (1.87–8.24)**
Education	Non-frail Pre-frail Frail	Ref 0.95 (0.54–1.66) 1.89 (1.01–3.52)*	Ref 0.95 (0.54–1.67) 1.90 (1.02–3.55)*	Ref 0.94 (0.54–1.66) 1.97 (1.05–3.69)*
Smoking status	Non-frail Pre-frail Frail	Ref 1.63 (0.75–3.49) 2.25 (0.91–5.55)	Ref 1.27 (0.56–2.89) 1.37 (0.51–3.70)	Ref 1.49 (0.61–3.61) 1.80 (0.57–5.66)
Exercise	Non-frail Pre-frail Frail	Ref 14.95 (5.10–43.64)** 50.18 (14.64–152.97)**	Ref 15.30 (5.21–44.92)** 52.57 (16.88–163.74)**	Ref 14.81 (5.07–43.26)** 49.48 (16.20–151.09)**
Body Mass Index	Non-frail Pre-frail Frail	Ref 1.21 (0.68–2.14) 0.83 (0.45–1.54)	Ref 1.26 (0.70–2.27) 0.85 (0.45–1.65)	Ref 1.07 (0.59–1.96) 0.83 (0.43–1.59)
Diabetes	Non-frail Pre-frail Frail	Ref 1.38 (0.75–2.53) 0.94 (0.49–1.78)	Ref 1.40 (0.76–2.58) 0.96 (0.50–1.85)	Ref 1.33 (0.71–2.50) 0.88 (0.45–1.72)
Hypertension	Non-frail Pre-frail Frail	Ref 1.06 (0.49–2.09) 0.74 (0.35–1.57)	Ref 0.93 (0.44–1.95) 0.74 (0.34–1.64)	 1.51 (0.76–3.02) 1.15 (0.55–2.40)
Cardiovascular diseases	Non-frail Pre-frail Frail	Ref 1.22 (1.07–2.59)* 6.31 (1.75–22.72)**	Ref 1.95 (1.07–3.54)** 7.53 (2.0–27.98)**	Ref 5.32 (1.40–19.20)* 6.06 (1.63–22.56)**
Total cholesterol level	Non-frail Pre-frail Frail	Ref 1.48 (0.82–2.65) 1.34 (0.71–2.54)	Ref 1.70 (0.93–3.11) 1.51 (0.77–2.97)	Ref 0.72 (0.25–2.12) 0.49 (0.15–1.58)
LDL-C level	Non-frail Pre-frail Frail	Ref 1.93 (1.08–3.46)* 2.04 (1.08–3.82)*	Ref 2.22 (1.20–4.08)* 2.17 (1.11–4.24)*	Ref 2.66 (0.93–7.56) 3.52 (1.14–10.88)*
HDL-C level	Non-frail Pre-frail Frail	Ref 1.54 (0.81–2.96) 1.10 (0.56–2.16)	Ref 1.57 (0.79–3.11) 1.32 (0.64–2.74)	Ref 1.62 (0.80–3.26) 1.25 (0.59–2.66)
Triglyceride level	Non-frail Pre-frail Frail	Ref 1.11 (0.58–2.13) 1.16 (0.57–2.38)	Ref 1.19 (0.61–2.30) 1.32 (0.63–2.78)	Ref 0.82 (0.40–1.70) 1.09 (0.49–2.42)

LDL-C, Low Density Lipoprotein Cholesterol; HDL-C, High Density Lipoprotein Cholesterol.
*P<0.05
**P<0.01

The female participants and the participants who did not exercise regularly were 3.93 (95% CI=1.87–8.24) and 49.48 times (95% CI=16.20–151.09) more likely to be frail than their counterparts, respectively. The participants who had cardiovascular diseases were 6.06 times (95% CI=1.63–22.56) more likely to be frail. Furthermore, those with a low educational level (<9 years) and high LDL-C level were 1.97 (95% CI=1.05–3.69) and 3.52 times (95% CI=1.14 –10.88) more likely to be frail than their counterparts, respectively (**Table 2**). Age, smoking status, BMI, diabetes, hypertension, total cholesterol level, HDL-C level and triglyceride level were not associated with either pre-frailty or frailty after being adjusted with other covariates.

Discussion

The prevalence of pre-frailty and frailty was 40.6% and 28.8%, respectively. These numbers are comparable with Indonesian (25.2%), Korean (20.2%), Turkish (27.8%) and Mexican reports (25.9–27.5%).[7,12–15] In a recent systematic review, the pooled prevalence of pre-frailty ranged between 35% and 50%, while that of frailty ranged from 7% to 12%, increasing to 26% in individuals aged over 85 years.[16]

The varying prevalence of frailty among studies is attributed to the different measurement tools and settings used. The use of the SHARE-FI and the Frailty Index has been found to classify more people into being frail compared with the use of the Fried Frailty Phenotype.[16] The prevalence of frailty in community-based, hospital-based or institutionalised older adults might differ. Using a community-based measurement tool, our study showed that around one out of four older adults in a community setting was frail and that this population was at risk for severe morbidity and mortality. Therefore, identifying older adults with frailty, especially in the context of community and preventive medicine, is crucial.

Our findings showed that the female participants had a higher risk of being pre-frail or frail, consistent with the findings from a systematic revier of many studies.[17] However, several studies have shown no associations, and the reasons were unclear.[18] In a previous study, female individuals have been shown to be more vulnerable to pre-frailty and frailty; this link might be attributed to the fact that women tend to live longer than do men but have poorer health.[19] The gap in the prevalence of frailty between men and women may also be explained by the survival effect in a previous study, wherein the frailest man died, and the healthiest man survived.[18] A low educational level was associated with an increased risk of frailty in our study. This result is also consistent with other study.[20] People with higher levels of education have the ability to obtain information about healthy habits, including better physical activity, diet, social participation, cognitive ability and functional ability and fewer comorbidities.[20]

Herein, the participants who did not exercise regularly showed a significantly increased risk of being pre-frail or frail compared with their counterparts. Other study also found that individuals who did not exercise or who had a sedentary lifestyle showed an increased risk of frailty.[3] A study has shown that physical activity probably prevents frailty (four studies; frailty score pooled standardised mean difference, 0.24 [95% CI=0.04–0.43]; P=0.017, I^2=57%, moderate certainty evidence).[21] Exercise interventions in nursing homes and long-term care facilities improve muscle strength and function.[21] In a recent study on older adults (<75 years) living in nursing homes, the Vivifrail multicomponent tailored exercise programme (www.vivifrail.com/resources/) was found to be effective in the short term (4 weeks) and to prevent severe functional decline and strength loss in institutionalised older adults (i.e. physical frailty reversion and recovery of autonomy).[22] Multicomponent exercise face-to-face interventions would seem advisable as an essential activity to protect older adults from severe functional decline.[22] Frailty can be lessened and pre-frailty reversed with exercise-based interventions. Maintaining exercise has also been shown to be beneficial in slowing the progression of frailty.

A community-based approach is the best method, and physical exercise is one of the main interventions with systemic effects proven to improve physical impairment related to frailty (low body mass, strength, mobility, physical activity level and energy).[23] Exercise is thought to be the first-line therapy for frail elderly individuals for improving their physical fitness, slowing deterioration and maintaining independence.[23] Several systematic reviews have concluded that structured, individualised prescribed exercise is beneficial for frail elderly individuals with regard to various outcome measurements, such as mobility, muscle strength, balance and rate of falls, cognitive function and quality of life.[24]

Given the multidimensional nature of frailty comprising physical, cognitive and social domains, reversing, preventing or slowing the progression of frailty requires a targeted multicomponent approach, including physical exercise and management of polypharmacy, falls, nutrition, loneliness, cognitive impairment and depression for reversal and/or prevention of frailty.[24]

A history of cardiovascular disease significantly increased the risk of pre-frailty and frailty in our study, consistent with other findings.[25-26] The all covariate-adjusted odds ratios in our study were 5.32 and 6.06 for pre-frailty and frailty, which are higher than other reports: from 1.43 to 4.1.[25-26] This finding suggests that the presence of cardiovascular diseases may have a strong impact on the prevalence of pre-frailty and frailty in our older adult population. Pre-frail and frail patients are more likely to have chronic heart failure, hypertension, coronary artery disease, diabetes and even subclinical disease identified using imaging.[27] They may also present accumulated negative conditions and diseases during their lifetime, making them more susceptible to cardiovascular diseases.[25] Having cardiovascular diseases may also worsen pre-existing frailty, as reported in some studies.[26] The interaction between cardiovascular disease and frailty is complex with the involvement of cellular oxidation, insulin resistance and catabolic neurohormonal state.[27] This mechanistic link has also affected the presence of chronic inflammation. The catabolic state causes the loss of muscle mass and strength and decreases mobility and physical activity, which contribute to frailty. Inflammation also plays an important role in promoting the oxidation of lipoprotein and the formation of plaques in patients with cardiovascular disease. Although inflammation is considered the cause of cardiovascular disease and frailty in older adults, the risk of pre-frailty and frailty is independent of age.[27] This finding suggests that inflammation is more associated with biological age than with chronological age.

In our study, the LDL-C level was positively associated with frailty; however, other study has shown no association between the LDL-C level and frailty.[28] Wang et al. showed that genetically predicted life-long reduction in the LDL-C level is associated with decreased frailty.[29] Hypercholesterolemia may influence frailty via several underlying mechanisms, including the promotion of endothelial dysfunction and inflammation. As an oxidative stress biomarker, modified LDL-C is a pro-inflammatory stimulant present in the circulation, affecting local sites in various tissues. Hence, it has the capacity to induce inflammation in a variety of tissues. LDL-C level monitoring over time is important, especially since the association with the Frailty Index is independent of any detected atherosclerotic pathogenesis. Some observational study results, which are generally prone to confounding, have revealed a null or an opposite association between the two.[30] Owing to the limited number of studies available, more research is needed to explore the effects of the LDL-C level on frailty.

The implication of the study findings is the elucidation of the predictors, which may prevent and slow the progression of frailty from pre-frailty, especially among older adults in Indonesia, who have different characteristics. Nonetheless, our study also has limitations. The first limitation is that some of the variables were self-reported, so there may be a recall bias. The second limitation is the cross-sectional study design, which could not elucidate any causal relationships between study variables.

Conclusion

Exercise, early screening and intervention for cardiovascular diseases and maintenance of lower LDL-C levels may prevent and slow the progression of frailty. Nevertheless, the associations between frailty and sex, exercise, presence of cardiovascular diseases and cholesterol level still need to be explored in future research.

Acknowledgements

We would like to show our gratitute to the Center of Health Research and Department of Public Health and Nutrition, School of Medicine and Health Science, Atma Jaya Catholic University of Indonesia for their support.

Author contributions

YSH: Conceptualization, Data Curation, Investigation, Methodlogy, Resources, Supervision, Writing – original draft, Writing – review & editing. YT: Data curation, Investigation, Supervision, Writing – review & editing. NTW: Conceptualization, Investigation, Supervision, Writing – review & editing. AH: Formal analysis, Methodology, Software, Writing – original draft.

Ethical approval

This study was approved by Atma Jaya Catholic University of Indonesia Ethical Committee (Ref No: 04/07/KEP-FKIKUAJ/2022).

Conflicts of interest

All authors declare no potential conflicts of interest.

Funding

There was no funding for this study.

Data sharing statement

The data were available upon reasonable request to Corresponding Author.

How does this paper make a difference in general practice?

- Research regarding the associated factors of both pre-frailty and frailty among older adults is important because although there are many studies regarding the associated factors of frailty, the results are inconsistent.
- Research among Indonesian older adults might show new insights owing to differences in sociodemography, geography, economy, access to healthcare and culture.
- The findings can guide family doctors and other primary care doctors in better identifying older adults with a higher risk of frailty and eventually in providing specific targeted solutions for prevention to improve the quality of life and overall life satisfaction of older adults.

References

1. Vaes B, Depoortere D, Van Pottelbergh G, Mathei C, Neto J, Degryse J. Association between traditional cardiovascular risk factors and mortality in the oldest old: untangling the role of frailty. *BMC Geriatr*. 2017;17:234. doi:10.1186/s12877-017-0626-x
2. United Nations, Department of Economic and Social Affairs, Population Division (2015). United Nations: World Population Ageing; 2015 (ST/ESA/SER. A/390). https://www.un.org/en/development/desa/population/publication/pdf/ageing/WPA2015_Report.pdf
3. Central Bureau of Statistics. Elderly Population Statistics. 2020.
4. Davinelli S, Corbi G, Scapagnini G. Frailty syndrome: a target for functional nutrients?. *Mech Aging Dev*. 2021;195:111441. doi:10.1016/j.mad.2021.111441
5. Sezgin D, Liew A, O'Donovan MR, O'Caoimh R. Pre-frailty as multi-dimensional construct: a systematic review of definitions in the scientific literature. *Geriatr Nurs*. 2020;41(2):139–146. doi:10.1016/j.gerinurse.2019.08.004
6. Siriwardhana DD, Hardoon S, Rait G, Weerasinghe MC, Walters KR. Prevalence of frailty and prefrailty among community-dwelling older adults in low-income and middle-income countries: a systematic review and meta-analysis. *BMJ Open*. 2018;8:e018195. doi:10.1136/bmjopen-2017-018195
7. Setiati S, Laksmi PW, Aryana IGPS, et al. Frailty state among Indonesian elderly: prevalence, associated factors, and frailty state transition. *BMC Geriatr*. 2019;19:182. doi:10.1186/s12877-019-1198-8
8. Izquierdo M, Merchant RA, Morley JE. Exercise, aging and frailty: guidelines for increasing function. *J Nutr Health Aging*. 2021;25(4):405–409. doi:10.1007/s12603-021-1590-x
9. Faul F, Erdfelder E, Buchner A, Lang AG. Statistical power analyses using G*Power 3.1: tests for correlation and regression analyses. *Behav Res Methods*. 2009;41:1149–1160. doi:10.3758/BF03193146
10. World Health Organization. Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. *Lancet*. 2004;363(9403):157–163.
11. Romero-Ortuno R, Walsh CD, Lawlor BA, Kenny RA. A frailty instrument for primary care: findings from the Survey of Health, Ageing and Retirement in Europe (SHARE). *BMC Geriatr*. 2010;10:57. doi:1-.1186/141-2318-10-57
12. Tan LF, Lim ZY, Choe R, Seetharaman S, Merchant R. Screening for frailty and sarcopenia among older persons in medical outpatient clinics and its associations with healthcare burden. *J Am Med Dir Assoc*. 2017 Jul 1;18(7):583–587. doi:10.1016/j.jamda.2017.01.004
13. García-Peña C, Ávila-Funes JA, Dent E, Gutiérrez-Robledo L, Pérez-Zepeda M. Frailty prevalence and associated factors in the Mexican health and aging study: a comparison of the frailty index and the phenotype. *Exp Gerontol*. 2016 Jun 15;79:55–60. doi:10.1016/j.exger.2016.03.016
14. Ko Y, Choi K. Prevalence of frailty and associated factors in Korean older women: the KLoSA study. *J Women Aging*. 2017 Jan 2;29(1):15–25. doi:10.1080/08952841.2015.1018069

15. Akın S, Mazıcıoglu MM, Mucuk S, et al. The prevalence of frailty and related factors in community-dwelling Turkish elderly according to modified Fried Frailty Index and FRAIL scales. *Aging Clin Exp Res*. 2015 Oct 1;27(5):703–709. doi:10.1007/s40520-015-0337-0

16. 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):1478–1492. doi:10.1111/j.1532-5415.2012.04054.x

17. Gordon EH, Peel NM, Samanta M, Theou O, Howlett SE, Hubbard RE. Sex differences in frailty: a systematic review and meta-analysis. *Exp Gerontol*. 2017 Mar 1;89:30–40. doi:10.1016/j.exger.2016.12.021

18. Chen L-J, Chen C-Y, Lue B-H, Tseng M-Y, Wu S-C. Prevalence and associated factors of frailty among elderly people in Taiwan. *Int J Gerontol*. 2014 Sep 1;8(3):114–119. doi:10.1016/j.ijge.2013.12.002

19. Hubbard RE. Sex differences in frailty. *Frailty Aging*. 2015;41:41–53. doi:10.1177/1745506518817995

20. Brigola AG, Alexandre T da S, Inouye K, Yassuda MS, Pavarini SCI, Mioshi E. Limited formal education is strongly associated with lower cognitive status, functional disability and frailty status in older adults. *Dement Neuropsychol*. 2019 Jun 18;13:216–224. doi:10.1590/1980-57642018dn13-020011

21. Oliveira JS, Pinheiro MB, Fairhall N, et al. Evidence on physical activity and the prevention of frailty and sarcopenia among older people: a systematic review to inform the World Health Organization physical activity guideline. *J Phys Act Health*. 2020;17(12):1247–1258. doi:10.1123/jpah.2020-0323

22. Dent E, Martin FC, Bergman H, Woo J, Romero-Ortuno R, Walston JD. Management of frailty: opportunities, challenges, and future directions. *Lancet*. 2019;395(10206):1376–1386. doi:10.1016/S0140-6736(19)31785-4

23. Courel-Ibanez J, Pallares JG, Garcia-Conesa S, Buendia-Romero A, Martinez-Cava A, Izquierdo M. Supervised exercise (vivifrail) protects institutionalized older adults against severe functional decline after 14 weeks of COVID confinement. *J Am Med Dir Assoc*. 2021 Jan;22(1):217–219.e2. doi:10.1016/j.jamda.2020.11.007

24. Puts MT, Toubasi S, Andrew MK, et al. Interventions to prevent or reduce the level of frailty in community-dwelling older adults: a scoping review of the literature and international policies. *Age Ageing*. 2017;46:383. doi:10.1093/ageing/afw247

25. Ruiz JG, Dent E, Morley JE, et al. Screening for and managing the person with frailty in primary care: ICFSR consensus guidelines. *J Nutr Health Aging*. 2020;24(9):920–927. doi:10.1007/s12603-020-1498-x

26. Sergi G, Veronese N, Fontana L, et al. Prefrailty and risk of cardiovascular disease in elderly men and women. *J Am Coll Cardiol*. 2015 Mar 17;65(10):976–983. doi:10.1016/j.jacc.2014.12.040

27. Huang C-Y, Lee W-J, Lin H-P, et al. Epidemiology of frailty and associated factors among older adults living in rural communities in Taiwan. Arch *Gerontol Geriatr*. 2020 Mar 1;87:103986. doi:10.1016/j.archger.2019.103986

28. Hwang A-C, Liu L-K, Lee W-J, et al. Association of frailty and cardiometabolic risk among community-dwelling middle-aged and older people: results from the I-Lan Longitudinal Aging Study. *Rejuvenation Res*. 2015 Dec 1;18(6):564–572. doi:10.1089/rej.2015.1699

29. Wang Q, Wang Y, Lehto K, Pedersen NL, Williams DM, Hägg S. Genetically-predicted life-long lowering of low-density lipoprotein cholesterol is associated with decreased frailty: a Mendelian randomization study in UK biobank. *EBioMedicine*. 2019 Jul 1;45:487–494. doi:10.1016/j.ebiom.2019.07.007

30. Jayanama K, Theou O, Blodgett JM, Cahill L, Rockwood K. Frailty, nutrition-related parameters, and mortality across the adult age spectrum. *BMC Med*. 2018;16(1):188. doi:10.1186/s12916-018-1176-6