ORIGINAL ARTICLE

Factors Associated With Frailty Among Older Adults Attending a Rural Public Primary Care Clinic in Malaysia

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ABSTRACT

Introduction: Frailty is a condition occurring in older age with a reduction in homeostatic reserve and inability to react against external stressors. This resulted in falls, disability, loss of independence and mortality. At present, there are limited studies on frailty in the rural settings in Malaysia. We aimed to determine the proportion of frailty and the factors associated with frailty among older adults attending a rural clinic in Selangor. **Methods:** A cross-sectional study involving older adults aged ≥60 years who attended a rural public healthcare clinic were recruited from February-April 2018 using a systematic random sampling method. Face-to-face interview using structured pretested questionnaires and physical assessment was conducted. Data collected included socio-demography, frailty status, functional status, cognitive function, self-reported chronic diseases and polypharmacy. All analyses were done using SPSS software version 22.0. **Results:** The response rate was 93% with 250 participants. A total of 29 (11.6%) participants were frail and 75 (30%) were pre-frail. The factors associated with pre-frail and frail among older adults were the presence of two chronic diseases or more (aOR=4.89; 95%CI=1.29, 18.51; p=0.019), presence of polypharmacy (aOR=1.97; 95%CI=1.05, 3.72; p=0.035), abnormal walking speed based on Time Up and Go test (aOR=12.80; 95%CI=4.57, 35.86; p<0.001), and dependent IADLs based on Lawton's IADLs (aOR= 3.06; 95%CI=1.28, 7.33; p=0.012). **Conclusion:** Older adults attending the rural primary clinic with risk factors such as multiple chronic diseases and polypharmacy should be screened for frailty as the condition is potentially reversible if interventions are started early.
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INTRODUCTION

Frailty is a clinical condition associated with physiological decline which subsequently result in marked vulnerability to adverse health outcomes (1). Frail older adults has high risk of developing unfavourable health effects such as falls, delirium, disability, loss of independency, hospitalization or even death (2). The prevalence of frailty in Asia is between 5.7% and 62.8% (3–6). In Malaysia, the prevalence of frailty was between 5.7% and 56.5%, while the prevalence of pre-frail was 57.9% to 72.8% (7). The variation in the prevalence of frailty and pre-frail can be due to the difference of tools used to define frailty and pre-frail and also different study settings.

Based on the frailty consensus 2013, frailty was described as "a medical syndrome with multiple causes and contributors that is characterized by diminished strength, endurance and reduced physiologic function that increases an individual's vulnerability for developing increased dependency and or/death" (1). It is paramount to identify frail older adult who is pre-disabled as intervention can be done to prevent dependency. Physicians can use a simple quick screening test that has been developed and validated especially in the primary care setting to rapidly recognize frail person. The commonly used and validated frailty tool included the FRAIL scale (8). Furthermore, detection of older adults that are pre-frail is useful as early treatment showed that frailty is potentially treatable and can delay progression of pre-frail to frailty state (8).

Systematic reviews showed that factors associated with frailty were older age, women, African American ethnic background, lower socio-economic status, obesity, limitation of activities of daily living, symptoms of depression, polypharmacy and impaired cognitive function (9,10). Similarly for studies in Malaysia found that frailty was associated with increasing age, women, lower socio-economic status, presence of more chronic

diseases, reduced muscle mass, at risk of malnutrition, low physical activity level, lower cognitive function and reduced rapid pace gait speed (11–14). Only one study has been conducted in a rural setting and the prevalence of frailty was 9.4% (15). In addition, this study found that older adults with low level of physical activity had worsening transition towards greater frailty state (OR 2.9, 95% CI 2.2–3.7) and lowered the likelihood of transitioning to less frailty states (OR 0.3, 95% CI 0.2–0.4) (15).

Currently, few studies assessed the factors associated with frailty among the rural population. The rural population is often not included in studies and little is known about this population health status especially on the risk factors for frailty such as polypharmacy, gait speed and functional status in our local context. Conducting a study in this population and understanding the associated factors for frailty in this population would provide additional insights on their health status, where healthcare providers could identify frailty in clinical practice, so that interventions that improve frailty can be implemented (16,17). Therefore, this study determined the proportion of frailty status and its associated factors in older adults aged 60 years and above in a rural public primary care clinic in Malaysia.

MATERIALS AND METHODS

Study design and participants

We conducted a cross sectional study in a rural public healthcare clinic in the Sepang District in Selangor, Malaysia. Based on the population statistics report in 2022, the clinic served a population of 67,767 people that comprised 52.5% men, 74.5% Malay ethnicity and 10.8% aged 60 years and above (18). The services provided in this clinic included outpatient clinic, covering chronic diseases and elderly care among other services. This clinic was chosen because it was located in rural area and its attendees consisted of about 20% of adults aged 60 years and above. The older adults aged 60 years and above who understands Malay and/or English were invited to participate in the study. Individuals with condition that could deter the assessment of level of frailty, such as severe osteoarthritis of the lower limbs, hearing, vision or cognitive impairment, require walking assistance, stroke and living in a residential facility and those who were acutely ill or unwell were excluded from participation. We recruited participants using systematic random sampling (1 in every fifth person) from February to April 2018. A sample size of 250 participants using the G*Power version 3.1.3 software (19) was estimated based on the proportion of older adults with pre-frail between gender (39% of men and 61% of women) (20) after taking into consideration significance level of 5%, a power of 80%, 20% non-response rate and 90% eligibility. In this study we were determining factors associated with pre-frail and frail older adults, hence we have calculated samples sizes using both pre-frail and frail older adults' findings. The sample size estimated using the pre-frail older adults yielded a larger sample size.

Data collection instrument and procedure

We collected data on socio-demography (age, sex, ethnicity, marital status, living arrangement, educational status and household income), frailty status (using FRAIL scale), and risk factors of frailty (self-reported chronic diseases, polypharmacy, walking speed based on Time Up and Go test, and functional status based on Modified Barthel's index and Lawton's Instrumental Activities of Daily Living Scale).

The FRAIL scale measured the frailty status which is a frailty screening tool that has been developed and validated for physicians to quickly recognize adults who are frail or pre-frail (8). FRAIL scale has predictive validity for frailty to determine future ADL difficulties, IADL difficulties, and death in both groups (21). It is a simple frailty screening test which consists of five questions of five domains which are fatigue, resistance, ambulation, number of illness and loss of weight. Each domain scores one mark and the total score ranges from 0-5. Fatigue was assessed on how often participants felt fatigued during the previous 4 weeks with answers of "all of the time" or "most of the time" scored one point. On the other hand, resistance was measured if participants have trouble walking up 10 steps by themselves with no rest and with no assistance. Ambulation assessed the difficulty of walking alone and with no support for several hundred metres; "yes" answers were scored as one point. Illness was assessed by asking participants on number of illnesses they have and one point is scored if participants stated five or more illnesses. Loss of weight was a self-reported weight reduction of 5% or more during the previous 12 months; "yes" answers were scored as one point. Robust is present if the score is 0, 1 – 2 scores for pre-frail and 3 – 5 scores for frail.

Chronic diseases were assessed by self-reported chronic medical illness consists of hypertension, diabetes mellitus, hypercholesterolemia, hearing or vision problem, heart disease, stroke, renal impairment, knee joint pain, urinary problem and others. Polypharmacy was assessed by asking participants how many medications were taken every day (polypharmacy is defined when five or more medications are taken every day) (22).

The walking speed test was assessed based on the Timed Up and Go (TUG) test is a physical mobility test that measures walking speed, agility and balance of a person based on length of time taken. It is reliable with a good correlation with the Barthel Index of ADL (r = -0.78), gait speed (r = -0.61) and Berg Balance Scale score (r = -0.81). It predicts "the patient's ability to go outside alone safely" (23). In TUG test, participants were asked to sit on a standard armchair and timing is measured starting

from when the patient is instructed to stand up, walk for 3 meters, then turn around, walk back and timing is stopped when patient sits down. If the participant takes a duration of 13.5s or longer in the TUG test, walking speed is considered as abnormal.

Activities of daily living limitation (ADLs) are based on the Modified Barthel's index while the instrumental activities of daily livings (IADLs) are measured using the Lawton's Instrumental Activities of Daily Living Scale (IADLs), respectively (24,25). Modified Barthel Index (MBI) consists of 10 domains of functional activities which are feeding, bathing, dressing, toilet use, grooming, bladder control, bowel control, climbing stairs, walking, and transfers (24). It is reliable with a Cronbach's alpha value of 0.90 (26). Participants rate as 0 for unable to perform task, 1 as need help to perform task and 2 as able to perform task independently for each item. A total score is obtained by adding all points for each item in which minimal score may be zero and maximal score may be 100. The higher the cumulative score, indicates greater independence. Dependence of ADLs was defined as a MBI score of 95 and less.

The Lawton Instrumental Activities of Daily Living Scale (IADLs) is a proper and reliable tool to evaluate independent living skills (25). This scale measures more complex functional activities comprises of 8 domains which are ability to use transportation, operate the telephone, self- administer medication, manage finances, shop independently, perform housekeeping, manage laundry and food preparation. Score can vary between 0 to 8 and in each category the score is given based on the highest level of functioning. Score of 7 and below was considered as dependent on the IADLs.

The questionnaire was available in both English and Malay languages. The FRAIL scale, modified Barthel's index and Lawton's Instrumental Activities of Daily Living Scale were translated into Malay, the official and national language of Malaysia as there were no available Malay versions at the point when we collected the data. Translation processes involved forward and backward translations conducted independently by qualified translators fluent in both languages. Two translators translated independently the scales from English to Malay and came to a consensus on the translated Malay version scales after a discussion. Two other bilingual translators independently translated the Malay version scales to English language and reached on a consensus through a discussion. All translated versions for the three scales were finalized following discussions among the researchers and translators.

Content of the final forward translations of these three scales were validated by an expert panel comprising two family medicine specialists (one with an interest in geriatric medicine), a geriatrician, an occupational therapist and a physiotherapist. The panel provided comments on the relevance of the questionnaire and suggested better terms to be used. For face validity, these scales were pre-tested with 25 older adults aged 60 years and above from another public healthcare clinic in the same district with similar socio-economic status to the participants in this study population. Informed consents were obtained and the participants were asked to clarify and to provide comments on the questions and response choices.

All older adults aged 60 and above were identified at the registration counter in the outpatient department of the clinic during the study period. The potential participants were screened based on the eligibility criteria. The sampling frame for this study was developed from a list of all potential participants aged 60 years and above who registered at the clinic for the purpose of either blood taking or medical consultation during the data collection period who fulfilled the eligibility criteria. Potential participants were explained about the study guided by the participant information sheet. We obtained both verbal and written informed consent from agreed participants of the study. Face-to-face one-to-one interviews using the structured pretested questionnaires were used to collect the data. We also conducted a physical assessment (TUG test) to assess the functional status. Both chronic diseases and polypharmacy data were verified by checking the participants' medical record.

Ethical considerations

Ethics approval was obtained from the Medical research Ethics Committee (MREC), Ministry of Health, Malaysia [NMRR-17-3046-39433] and supported by the Ethic Committee for Research involving Human Subject, Universiti Putra Malaysia. This study also received permissions from Selangor Health State Department and Sepang District Health Office. Participants provided verbal and written informed consent after they were informed about the study and had read the participants information sheet. All participations were voluntary. Non-identifiable identification codes were assigned to the participants for the purpose of data entry and data analysis. We stored the consent forms, and questionnaires in a locked filing cabinet for 7 years and accessible only by the researcher team. After 7 years these documents will be shredded and disposed in secure bins. In the report writing or publication, the participants would not be identified.

Data analysis

In the descriptive statistics, continuous variables were summarized as means and standard deviations, while the categorical variables were presented as frequencies and percentages. For all of the study variables in the univariate binary logistic regression analyses, enter method was used to determine the associated factors of pre-frail and frail. Participants who were pre-frail and frail were re-categorized as one category, as pre-frail

status has been identified as a subgroup at high risk of becoming frail (27). Those who in the robust category were considered as the reference group. We selected variables with a significance level of ≤0.250 from the univariate analyses for the multiple logistic regression model. We used the enter method for an addition of the variable to determine the association with pre-frail and frail. Presence of multicollinearity between the independent variables were determined by the variance inflation factor (VIF), where multicollinearity exist if VIF is greater than 5 to10 and lower than 0.1 to 0.2 (28). We reported the adjusted odds ratio, 95% confidence level and p-value to determine the strength of each variable to determine association with pre-frail and frail. We analyzed the data using SPSS version 22.0.

RESULTS

A total of 270 older adults aged 60 years and above were approached to participate in this study. The response rate was approximately 93%, with the final total of participants were 250 when 20 older adults disagree to participate as they did could not commit with the time. Table I summarized the study participants' profile.

The mean age of participants was 67.48 years old (SD 0.351) and most aged between 60 and 69 years old (65.4%). Majority of the participants were Malays (57.2%), married (71.2%), live with more than one person in their home (67.6%) and with monthly household income of B40 (RM3000.00 and less) classification (90.8%). The average monthly household income was RM1761.16 (SD 97.4).

In this study, 11.6% (n=29) of the participants were frail and 30.0 % (n=75) were pre-frail. As for the risk factors for pre-frail and frail, 86.8% (n=217) of the participants had two or more number of chronic diseases, 56.4% (n=141) had no polypharmacy, 20.8% (n=52) had abnormal walking speed, 91.6% (n=229) had independent ADLs, and 80.4% (n=201) had independent IADLs.

Based on the univariate logistic regression (Table II) having 2 and more chronic diseases, had polypharmacy, abnormal walking speed, had dependent ADLs and had dependent IADLs were significantly associated with pre-frail and frail (all p-values <0.001). The variables with p-values <0.250 included in the multivariate logistic regression were age, gender, marital status, living arrangement, presence of chronic diseases, presence of polypharmacy, TUG test, Modified Barthel's index and Lawton's IADLs.

The factors that were associated with pre-frail and frail among older adults were presence of 2 chronic diseases and more (aOR=4.89; 95%CI=1.29, 18.51; p=0.019), presence of polypharmacy (aOR=1.97; 95%CI=1.05, 3.72; p=0.035), abnormal walking speed based on Time Up and Go test (aOR=12.80; 95%CI=4.57, 35.86; p<0.001), and dependent IADLs based on Lawton's IADLs (aOR= 3.06; 95%CI=1.28, 7.33; p=0.012) (Table III). There was no multicollinearity between the factors associated with pre-frail and frail .

Table I: Profile of the study participants (N=250)

Variable	Result N (%)	Mean±SD
Age, years		67.48±0.35
• 60-69	164 (65.4)	
• 70 and above	86 (34.4)	
Gender		
• Male	126 (50.4)	
• Female	124 (49.6)	
Ethnicity		
• Malay	143 (57.2)	
• Chinese	71 (28.4)	
• Indian	36 (14.45)	
Marital status		
• Single	3 (1.2)	
• Married	178 (71.2)	
• Divorced	10 (4.0)	
• Widowed	59 (23.6)	
Living arrangement		
• Living alone	11 (4.4)	
• Living with 1 person	70 (28)	
• Living with ≥2 persons	169 (67.6)	
Monthly household income, RM		1200.00
• 0-3000.00 (B40 classification)	227 (90.8)	±97.40
• 3000.00 – 6275.00 (M40 classification)	17 (6.8)	
• More than 6275.00 (T20 classification)	6 (2.4)	
Frailty status		
• Robust	146 (53.4)	
• Pre-frail	75 (30.0)	
• Frail	29 (11.6)	
Number of self-reported chronic diseases		
• 0-1	33 (13.2)	
• ≥2	217 (86.8)	
Presence of polypharmacy		
• No	141 (56.4)	
• Yes	109 (43.6)	
Time Up and Go test, seconds		
• Normal	198 (79.2)	
• Abnormal	52 (20.8)	
Modified Barthel Index		
• Independent ADLs	229 (91.6)	
• Dependent ADLs	21 (8.4)	
Lawton IADLs		
• Independent IADLs	201 (80.4)	
• Dependent IADLs	49 (19.6)	

Note: SD = standard deviation, ADLs = activity of daily livings, IADLs = instrumental activity of daily livings

DISCUSSION

Our study found that modifiable factors associated with pre-frail and frail were chronic diseases, polypharmacy, abnormal walking speed and dependent IADLs. These factors could be used to develop future interventions to prevent frailty or delay its progression among the older adults.

We found that the proportion of participants who were frail and pre-frail were 11.6% and 30.0 %, respectively. In Malaysia, the prevalence of frailty was between 5.7% and 56.5%, while the prevalence of pre-frail ranged from 57.9% to 72.8% (7). The findings of a study by Ahmad et. al. on rural population in Kuala Pilah reported a comparable prevalence of frailty at 9.4% (15). However,

Table II: Univariate logistic regression on factors associated with pre-frail and frail

Variables	OR (95%CI)	p-value
Age, years		
• 60-69	Ref	0.094
• 70 and above	1.57 (0.93, 2.66)	
Gender		
• Male	Ref	0.100
• Female	1.53 (0.92, 2.54)	
Ethnicity		
• Malay	1.11 (0.67, 1.84)	0.695
• Non-Malay	Ref	
Marital status		
• Not married	1.62 (0.93, 2.81)	0.088
• Married	Ref	
Living arrangement		
• Living alone/less than 2 persons	1.43 (0.83, 2.47)	0.199
• Living with ≥2 persons	Ref	
Monthly household income, RM		
• B40 classification	1.37 (0.56, 3.37)	0.488
• Not B40 classification	Ref	
Number of self-reported chronic diseases		
• Less than 2	Ref	**<0.001***
• 2 and above	8.71 (2.58, 29.39)	
Presence of polypharmacy		
• No	Ref	**<0.001***
• Yes	3.59 (2.12, 6.09)	
Time Up and Go test, seconds		
• Normal	Ref	**<0.001***
• Abnormal	18.51 (7.49, 45.70)	
Modified Barthel Index		
• Independent ADLs	Ref	**<0.001***
• Dependent ADLs	9.98 (2.56, 34.86)	
Lawton IADLs		
• Independent IADLs	Ref	**<0.001***
• Dependent IADLs	4.78 (2.41, 9.49)	

Note: OR = odds ratio, CI = confidence interval, Ref = reference group, ADLs = activity of daily livings, IADLs = instrumental activity of daily livings
*p-value = significance level of <0.05

their study showed higher pre-frail prevalence as those found in other Malaysian studies in comparison to our findings. A study in Spain among older adults attending primary care centres found that pre-frail was common (29), hence, explains the higher prevalence of pre-frail in our study as it was conducted in a primary care clinic. The lower proportion of pre-frail compared to the other studies could be due to the scale used to measure frail and pre-frail status. All of the Malaysian studies used Fried's phenotype scale including the study by Ahmad et. al. (7). One study used Frailty index (20), while no local study has used the FRAIL scale.

Our study found older adults with 2 and more chronic diseases were associated with pre-frail and frail. This was similar to the findings of study conducted in a rural setting in Malaysia (15). The possible mechanism for this association is that presence of multiple chronic diseases is compounded by a variety of factors such as disease control, pharmacological therapy used for the treatment of chronic diseases and potential unhealthy lifestyle adoption which can lead to frailty (30). However, some of these factors were not assessed in our study.

At present there is no study evaluated the association between polypharmacy and frailty in Malaysia. Polypharmacy can lead to falls, adverse drug reactions, functional disability and prolonged hospital stay, which are associated with frailty (10). In addition, presence of multiple chronic diseases is associated with multiple

Table III: Multiple logistic regression analysis on factors associated with pre-frail and frail

Variables	Beta	SE	Adjusted Odds Ratio	95%CI	VIF	p-value
Age, years						
• 60-69	Ref				1.11	0.767
• 70 and above	-0.11	0.36	0.90	0.45, 1.81		
Gender						
• Male	Ref				1.16	0.632
• Female	0.16	0.34	1.18	0.61, 2.27		
Marital status						
• Not married	0.25	0.37	1.29	0.62, 2.68	1.17	0.496
• Married	Ref					
Living arrangement						
• Living alone/less than 2 persons					1.05	0.643
• Living with ≥2 persons	0.16	0.34	1.17	0.60, 2.27		
	Ref					
Number of self-reported chronic diseases						
• Less than 2					1.14	**0.019***
• 2 and above	Ref					
	1.59	0.68	4.89	1.29, 18.51		
Presence of polypharmacy						
• No	Ref				1.19	**0.035***
• Yes	0.68	0.32	1.97	1.05, 3.72		
Time Up and Go test, seconds						
• Normal					1.42	**<0.001***
• Abnormal	Ref					
	2.55	0.53	12.80	4.57, 35.86		
Modified Barthel's Index						
• Independent ADLs	Ref				1.32	0.813
• Dependent ADLs	0.21	0.87	1.23	0.22, 6.76		
Lawton IADLs						
• Independent IADLs	Ref				1.33	**0.012***
• Dependent IADLs	1.12	0.45	3.06	1.28, 7.33		

Note: OR = odds ratio, CI = confidence interval, VIF = variance inflation factor, Ref = reference group, ADLs = activity of daily livings, IADLs = instrumental activity of daily livings; *p-value = significance level of <0.05; Chi-square (8) = 11.27, p = 0.187; Nagelkerke R^2 = 0.411

pharmacological therapy usage, which could lead to poor worsening of physical and mental health status, hence leading to frailty (31).

In our study, the abnormal walking speed associated with pre-frail and frail is supported by local studies that showed lower gait speed among those who were pre-frail and frail (13,14). The Time Up and Go test used as an item in the FRAIL scale that is sensitive and specific for frailty in situation that requires quick assessment to identify frail individuals as in primary care settings. However, it does not reliably identify pre-frail individuals (32).

There is limited study that examined the association between functional status and frailty in Malaysia. Our study showed significant association between functional disability based on the Lawton IADL and frailty. Similarly, a prospective cohort study showed the risk of loss of functional independence in prefrail and frail older adults in France (33). In addition, most of their participants had at least one disability in the instrumental activity of daily living.

The findings of this study added on to the gaps in knowledge related to factors associated with frailty. However, this study is not without limitations. First, the causal-effect relationship could not be determined in our study as it was a cross sectional study. Second, there could be bi-directional relationships for some of the factors associated with frailty. For example, functional disability may be associated with frailty, but frailty per se could also result in functional disability as frailty is multifactorial. Thus the findings cannot be concluded as a cause or an effect. Third, our study used FRAIL scale as frailty tool which is not widely used like Fried's criteria or Frailty index as it was relatively new. This tool was chosen due its simplicity, feasibility and a valid tool to screen frailty in the primary care settings. Therefore, its role will be more applicable in screening for older adults with potential frailty rather than in assisting in making diagnosis. However, it is still applicable for clinical practice in primary care setting that is constraint by human and time resources as compared to Fried's phenotype scale. In addition, our study excluded older adults who required walking assistance where they are frail, hence, we may have underestimated the proportion of older adults who are frail. Lastly, the findings of this study cannot be generalized to a wider rural population in Malaysia as it was conducted in one health clinic in a rural setting.

CONCLUSION

Our study found presence of chronic diseases, polypharmacy, abnormal walking speed and dependent IADLs to be associated with pre-frail and frail older adults in a rural public primary care clinic. These variables can be prevented through primary and secondary preventive efforts from the healthcare perspectives. In addition, the findings could improve the local practice in primary care by implementing screening for frailty status for certain group of older adults such as those with multiple chronic illnesses and those with polypharmacy. Future research should focus on more rural settings in Malaysia including the East Malaysia. In addition, conducting a prospective study could evaluate changes over time on the factors that predict frailty status.

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