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Prevalence of Fear of Falling and Its Association with Frailty Among Community-Dwelling Older Adults in Northern Thailand

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Abstract

Frailty in the elderly population is a known risk factor for common geriatric syndromes, contributing significantly to adverse health outcomes. Therefore, we examined the relationship between prevalence of fear of falling and frailty among older adults. A cross-sectional design was employed, and data were collected through in-person interviews conducted between April and May 2024. Participants were selected through simple random sampling from a total of 409 individuals aged 60 years or older, who were included in the analysis. The fear of falling (FOF) was evaluated using the Short Falls Efficacy Scale International (Short FES-I). Frailty was evaluated using the Thai version of the Simple Frailty Questionnaire (T-FRAIL). The mean age was 69.5 years, and 58.7% were female. The prevalence rates were 47.4% for non-frailty, 39.1% for pre-frailty, and 13.4% for frailty among older adults. Multinomial logistic regression analysis revealed that pre-frail adults had significantly higher odds of high FOF (OR: 5.27; 95% CI: 3.16-8.80, p-value < 0.001), whereas frail adults had significantly higher odds of moderate FOF (OR: 4.37; 95% CI: 1.55-12.32, p-value = 0.005) and high FOF (OR: 17.36; 95% CI: 6.79-44.39, p-value < 0.001) compared to a reference group of non-frail participants. Preventing frailty and pre-frailty among older adults could involve interventions that target various risk factors, such as demographic characteristics, and FOF.

INTRODUCTION

Frailty is one of the most prevalent geriatric syndromes affecting the elderly population (Chen et al., 2014). Pathological aging is linked to a marked increase in vulnerability, resulting in an elevated risk of negativel health outcomes (Chen et al., 2014; Kolle et al., 2023). Previous studies included in systematic reviews and meta-analyses have reported a prevalence of 13.6% for frailty and 7% for physical frailty (Ofori-Asenso et al., 2019; O'Caoimh et al., 2021). The prevalence of frailty among older adults living in community settings within Asian countries has been reported to be 20.5% (To, et al., 2022). In comparison, the prevalence among older adults in Thailand was slightly lower, at 16.6% (Morkphrom et al., 2022). Additionally, aging typically involves a decline in physiological reserves, affecting both physical and mental health in older individuals (Chen et al., 2014; WHO, 2023). Previous literature reviews have identified frailty as characterized by signs and symptoms similar to those observed in overall bodily deterioration, exacerbated by vari-

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ous risk factors such as demographic characteristics, low physical activity, malnutrition, vitamin D deficiency, history of falls, and comorbidities (Xue, 2011; Ofori-Asenso et al., 2019; Wang et al., 2022; Qin et al., 2023). These factors are significant contributors to morbidity and mortality among the elderly (Peng et al., 2022; Castillo-Angeles et al., 2021).

Frailty as a geriatric syndrome was originally proposed by Fried et al. (2001) and further explored by Sriwong et al. (2022). The Fried frailty phenotype is characterized by five components: involuntary weight loss, fatigue, diminished muscular strength, reduced gait speed, and low levels of physical activity (Fried et al., 2001). Sriwong et al. (2022) developed the Thai version of the simple frailty questionnaire (T-FRAIL) to assess frailty, incorporating criteria such as fatigue, resistance, ambulation, illnesses, and weight loss. Previous studies have identified several factors associated with frailty in older adults, including sex, age, biological and socioeconomic factors, low physical activity, osteoarthritis, and comorbidities (Ofori-Asenso et al., 2019; O'Caoimh et al., 2021; Sadjapong et al., 2024). Northern Thailand is a region characterized by its mountainous terrain, bordering Myanmar and Laos (The Government Public Relations Department, 2022). Phayao Province, one of the eight provinces comprising the Upper Northern region, is geographically characterized by a basin-like landscape enclosed by surrounding mountain ranges (Amazing Thailand, 2024; Sapbamrer et al., 2025). A prior study conducted in Southeast Asia reported that the prevalence of fear of falling (FOF) among among older adults varied widely, ranging from 21.6% to 88.2% (Vo, et al., 2023). Additionally, a study conducted in Northern Thailand reported that the prevalence of frailty among older adults were 35.1% for non-frailty, 50.9% for pre-frailty and 13.9% (Thinuan et al., 2020). The prevalence of falls among older adults in Asia is reported to be 25.8%, whereas in the Phu Kamyao District of Phayao Province, located in Northern Thailand, 12.7% of older adults reported experiencing a fall within the past year (Salari et al., 2022; Silangirn et al., 2024). Therefore, this study examined demographic characteristics, and prevalence of FOF in relation to frailty among older adults living in the community, Northern Thailand.

METHOD

A cross-sectional study design was employed, and data were collected through in-person interviews conducted between April and May 2024. The study was conducted in Phu Kamyao district, Phayao Province, the Upper Northern region of Thailand. The sample size was determined using the finite population proportion formula (Krejcie et al., 1970). We used the frailty prevalence (p) of a previous study in Thailand of 37.4% (Sadjapong et al., 2020). The population (N) was 6,389, $p = 0.374$, the value $^2 = 3.841$, and the acceptable margin of error (e) = 0.05, with a precision of 20%. A random sample of 409 individuals aged 60 years and above was drawn from a sub-district health promoting hospital. The inclusion criteria required participants to be aged 60 years or older and to provide consent for participation in the study. Individuals aged 60 years or older who were unable to communicate were excluded. A face-to-face interview was conducted using structured questionnaires administered by trained public health volunteers. The measurements included a structured questionnaire, demographics, medical conditions, FOF, and frailty.

Data were collected using structured questionnaires that gathered both demographic and health-related information, including age, gender, body mass index (BMI), education, marital status, smoking, alcohol, history of falls in the past year, chronic health conditions, and body mass index (BMI). BMI was classified into three categories: underweight (<18.5 kg/m²), normal weight (18.5–24.9 kg/m²), and overweight (≥25 kg/m²) (WHO, 2010). The short FES-I was utilized to assess FOF, and fall-related concerns. The Short Falls Efficacy Scale International (Short FES-I) consists of seven items rated on a 4-point Likert scale, yielding total scores ranging from 7, indicating minimal concern about falling, to 28, indicating a high level of concern. FOF, as measured by the Short FES-I, was categorized into three levels: low (scores of 7–8), moderate (scores of 9–13), and high (scores of 14–28) (Healthy Ageing Research Group, 2005; Yardley et al., 2005).

The Ministry of Public Health (2021) and Sriwong et al. (2022) developed tools for screening the frailty in the elderly. Frailty was assessed based on the T-FRAIL and tested for validity and reliability by Sriwong et al. (2022). The T-FRAIL questionnaire comprises five components: fatigue, resistance, ambulation, illness, and unintentional weight loss. The specific items are as follows: (1) Fatigue: "In the past four weeks, how often have you experienced fatigue?"; (2) Resistance: "Do you have difficulty walking up 10 steps by yourself without stopping or using assistive devices?"; (3) Ambulation: "Do you have difficulty walking 300–400 meters by yourself without stopping or using assistive devices?"; (4) Illness: "Have you been diagnosed by a physician with a congenital

Table 1. Demographic Characteristics and Health Status.

Characteristics	Frequency	Percentage (%)
Gender		
Male	169	41.3
Female	240	58.7
Age (years)		
< 65	115	28.1
65 – 69 years	134	32.8
≥ 70 years	160	39.1
BMI (kg/m^2)		
Underweight	61	14.9
Normal weight	234	57.2
Overweight	114	27.9
Educational level		
Primary school or below	372	91.0
Above primary school	37	9.0
Marital status		
Married	283	69.2
Single	18	4.4
Others	108	26.4
Smoking		
No	338	82.6
Yes	71	17.4
Alcohol		
No	302	73.8
Yes	107	26.2
History of falls in the past year		
No	356	87.0
Yes	53	13.0
Chronic health conditions		
Hypertension	235	57.5
Arthritis	77	18.8
Diabetes mellitus	63	15.4
Osteoporosis	25	6.1

disease involving more than four conditions?"; and (5) Loss in body weight: "Have you experienced unintentional weight loss of more than 5% of your body weight compared to your weight from the previous year?". Frailty status is scored on a scale of 0 to 5, with the following classifications: a score of 0 denotes non-frail, scores of 1 to 2 indicate pre-frail, and scores between 3 and 5 signify frailty. This scoring system allows for a systematic assessment of an individual's frailty status (Institute of Geriatric Medicine, 2015; Ministry of Public Health, 2021; Sriwong et al., 2022).

Descriptive statistics—including percentages, means, and standard deviations (SD)—were computed to summarize participants' demographic characteristics, health status, FOF, and frailty levels. Multinomial logistic regression analysis was employed to assess the associations between FOF and frailty status. The study was approved by the Research Ethics Committee of the University of Phayao, Thailand (HREC-UP-HSST 1.2/059/67).

RESULT AND DISCUSION

A total of 409 participants were enrolled in the study. The mean age of the sample was 69.5 years (SD = 7.1), and the average BMI was 22.5 kg/m² (SD = 4.0). Among all participants, 58.7% were female, 39.1% were aged 70 years or older, 69.2% were married, 57.22% had a BMI within the normal range, 91.0% had completed education ≤ primary school, 82.6% were non-smokers, 73.8% did not alcohol drinking, and 87.0% reported no

history of falls in the past year. Regarding chronic health conditions, 57.5% had hypertension, 18.8% had arthritis, 15.4% had diabetes mellitus, and 6.1% had osteoporosis (Table 1).

The prevalence among older adults was 13.4% for frailty, 39.1% for pre-frailty, and 47.4% for non-frailty. The prevalence of FOF was 39.9% for high FOF, 21.0% for moderate FOF, and 39.1% for low FOF (Table 2). According to a recent systematic review and meta-analysis by Xiong et al. (2024), the global prevalence of FOF is estimated at 49.6%, with reported rates ranging from 6.96% to 90.34%(Xiong et al., 2024). The analysis also revealed a higher prevalence in developing countries (53.4%) compared to developed countries (46.7%) (Xiong et al., 2024). Several factors have been associated with FOF, including advanced age, a history of falls, arthritis, osteoporosis, chronic diseases, and mental health conditions (Silangirn et al., 2024; Xiong et al., 2024). In addition, a systematic review and meta-analysis conducted by Siriwardhana et al. (2018) reported that the prevalence of pre-frailty and frailty among older adults was 49.3% and 17.4%, respectively (Siriwardhana et al., 2018). In Asian countries, another systematic review and meta-analysis reported a frailty prevalence of 20.5% among older adults (To et al., 2022). Previous studies indicated that chronic diseases were prevalent in 11% of those classified as low-frailty, 26% in medium-frailty, and 44% in high-frailty categories (Mangin et al., 2023). The prevalence of frailty and pre-frailty among older adults has been found to be lower in high-income countries compared to upper-middle-income countries, likely due to more effective healthcare systems and management strategies (Siriwardhana et al., 2018).

Table 2. Characteristics of FOF, and Frailty Status.

Variable	n (%)
FOF	
Low (7–8 points)	160 (39.1)
Moderate (9–13 points)	86 (21.0)
High (14–28 points)	163 (39.9)
Frailty	
Non-frail (0 points)	194 (47.4)
Pre-frail (1–2 points)	160 (39.1)
Frail (3 points and above)	55 (13.4)

The multinomial logistic regression analysis revealed that in pre-frail older adults compared to a reference group of non-frail participants, age ≥ 70 years (OR: 2.03; 95%CI: 1.20-3.44, p-value=0.009), history of falls in the previous year (OR: 4.17; 95%CI: 1.90-9.16, p-value<0.001), hypertension (OR: 1.54; 95%CI: 1.01-2.35, p-value=0.047), arthritis (OR: 2.56; 95%CI: 1.46-4.49, p-value=0.001), diabetes mellitus (OR: 2.39; 95%CI: 1.30-4.40, p-value=0.005), osteoporosis (OR: 5.65; 95%CI: 1.86-17.15, p-value=0.002), and high FOF (OR: 5.27; 95%CI: 3.16-8.80, p-value<0.001) were significantly higher. Additionally, in frail older adults compared to a reference group of non-frail participants, age ≥ 70 years (OR: 2.14; 95%CI: 1.03-4.46, p-value=0.043), history of falls in the previous year (OR: 9.20; 95%CI: 3.81-22.17, p-value<0.001), arthritis (OR: 2.30; 95%CI: 1.08-4.92, p-value=0.031), diabetes mellitus (OR: 2.30; 95%CI: 1.02-5.19, p-value=0.044), moderate FOF (OR: 4.37; 95%CI: 1.55-12.32, p-value=0.005), and high FOF (OR: 17.36; 95%CI: 6.79-44.39, p-value<0.001) were significantly higher (Table 3).

This study identified associations between pre-frail and frail older adults with ages ≥70 years and a history of falls in the previous year. Previous studies have consistently shown that the prevalence of pre-frailty and frailty increases with age (Hanlon et al., 2018; To et al., 2022). Additionally, these studies have demonstrated that pre-frailty and frailty are associated with an elevated risk of falls among older adults (Chittrakul et al., 2020; Lu et al., 2021; Sadjapong et al., 2024). This study further identified associations of chronic diseases, such as arthritis and diabetes mellitus, with pre-frail and frail older adults. Notably, no significant associations were found between hypertension and osteoporosis in frail older adults. Another study highlighted a correlation between the prevalence of pre-frailty and frailty and increased multimorbidity (Hanlon et al., 2018). Moreover, a systematic review and meta-analysis by Vetrano et al. (2019) identified a significant association between multimorbidity and frailty (Vetrano et al., 2019). Additionally, individuals aged 70 years and older are at increased risk of developing pre-frailty and frailty due to age-related physiological changes, a greater prevalence of chronic diseases, and various lifestyle factors (Fried et al., 2021; Wang et al., 2022; Kyrdalen et al., 2024). These contributing factors may lead to declines in both physical and cognitive functioning, thereby increasing the likelihood of adverse health outcomes (Chen et al., 2014; Fried et al., 2021; Wang et al., 2022).

Furthermore, previous studies have identified several risk factors that contribute to increased fall risk, including age, gender, occupation, alcohol use, socioeconomic factors, FOF, history of falls, physical inactivity, and unsafe environments (WHO., 2019; Li et al., 2023). Our

Table 3. Association Between Demographic Characteristics, Health Status, FOF, and Frailty by Using Multinomial Logistic Regression Analysis

Associated factors	Pre-frail	Frail
	OR (95%CI)	OR (95%CI)
Age (years)		
<65	Ref	Ref
65–69 years	1.01 (0.59-1.74)	0.78 (0.34-1.779
≥70 years	2.03 (1.20-3.44)**	2.14 (1.03-4.46)*
History of falls in the past year		
No	Ref	Ref
Yes	4.17 (1.90-9.16)***	9.20 (3.81-22.17)***
Chronic health conditions		
Hypertension		
No	Ref	Ref
Yes	1.54 (1.01-2.35)*	1.28 (0.70-2.35)
Arthritis		
No	Ref	Ref
Yes	2.56 (1.46-4.49)**	2.30 (1.08-4.92)*
Diabetes mellitus		
No	Ref	Ref
Yes	2.39 (1.30-4.40)**	2.30 (1.02-5.19)*
Osteoporosis		
No	Ref	Ref
Yes	5.65 (1.86-17.15)**	3.73 (0.90-15.41)
FOF		
Low	Ref	Ref
Moderate	1.16 (0.64-2.10)	4.37 (1.55-12.32)**
High	5.27 (3.16-8.80)**	17.36 (6.79-44.39)***

OR = odd ratio; CI = confidence interval; the reference group of pre-frail and frail variable was non-frail; *p-value<0.05; **p-value<0.01; ***p-value<0.001

study found that moderate FOF, and high FOF were significantly associated with pre-frail, and frail older adults.

Previous studies have indicated that high FoF is linked to an elevated risk of frailty (de Souza et al., 2022). Another study identified FoF as an initial screening tool for assessing frailty risk in clinical practice (Qin et al., 2021). Furthermore, a review of the literature highlighted that managing frailty in the elderly population focuses on comprehensive geriatric assessment (Lee et al., 2020).

CONCLUSION

The prevalence of frailty among older adults was 13.4%, with 39.1% classified as pre-frail and 47.4% as non-frail. Multinomial logistic regression analysis indicated that both pre-frail and frail individuals were significantly more likely to report elevated levels of FOF compared to non-frail participants. These findings indicate that FOF is strongly associated with frailty status among older adults. Furthermore, individuals with a history of falls and chronic illnesses may be particularly vulnerable and should receive targeted healthcare interventions. The inclusion of key findings and the implementation of targeted interventions are recommended to address modifiable factors associated with frailty and FOF. These measures may contribute to reducing the progression of frailty and improving the overall well-being of community-dwelling older adults.

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