

## Original Article

# Study of knee pain, fear of falling, and quality of life among community-dwelling older adults, Northern Thailand

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## Abstract

Fall is the leading cause of disability and mortality due to unintentional injury in older adults. The aim of this study was to determine the prevalence and risk factors associated with knee pain, fear of falling, and quality of life among community-dwelling older adults in Northern Thailand. A cross-sectional study was conducted among older adults aged 60 and over. A total of 369 participants were enrolled from April to May 2024. Oxford knee score, a short version of the Falls Efficacy Scale International (FES-I) and World Health Organization quality of life-BREF-Thai, was measured. The results showed that the mean age was 69.4 years and 47 (12.7%) had a history of falls in the previous year. The prevalence of fear of falling was 39.3% for low, 22.5% for moderate, and 38.2% for high concern. Age, marital status, alcohol, history of falls, hypertension, arthritis, and osteoporosis were associated with fear of falling. After adjusting to age, gender, body mass index, education, marital status, smoking, alcohol, history of falls, and chronic disease, osteoarthritis of the knee was positively associated with increasing fear of falling ( $\beta$ : 0.361;  $p < 0.001$ ), while quality of life was negatively associated with fear of falling ( $\beta$ : -0.064;  $p < 0.011$ ). In conclusion, the identified determinants of fear of falling among the elderly indicated the need for fear of falling prevention programs targeting not only individual lifestyles but also chronic diseases. This study provides useful information that might help to develop and adopt effective policies for fear of falling control in Thailand.

**Keywords:** Knee pain, fear of falling, falls, quality of life, older adults

## Introduction

Fall is the most common cause of disability and unintentional injury deaths in older adults, including decreased ability to perform daily activities and reduced quality of life (QoL) [1,2]. According to the World Health Organization (WHO), the number of older adults over 60 will increase from 1 billion in 2020 to 2.1 billion in 2050 [3]. A systematic review and meta-analysis reported that the prevalence rate of falls in older adults was 26.5% [4]. The prevalence of falls in older adults is 34.4% in Oceania, 27.9% in America, 25.8% in Asia, 25.4% in Africa, and 23.4% in Europe [4].



According to WHO, fall risk factors in older adults can be categorized into four dimensions: biological, behavioral, environmental, and socioeconomic factors [5]. Several studies have previously found that the majority of falls in older adults are caused by multiple risk factors such as age, gender, medication, decreased mobility and balance, lack of physical activity, muscle weakness, visual impairment, cognitive performance, fear of falling (FOF), depression, dizziness, and osteoarthritis [1,4-7]. In addition, previous studies found that FOF is an abnormal psychological consequence that can lead to increased fall risk [7,8]. A systematic review in Southeast Asia reported that the prevalence rates of FOF in older adults ranged from 21.6% to 88.2% [9]. Previous studies found that an increased risk for osteoarthritis (OA) of the knee is associated with increased FOF and may also lead to the risk of falling [10,11]. Knee OA is a degenerative joint disease and the most common cause of arthritis in older adults [11,12]. Therefore, the aim of this study was to determine the prevalence and risk factors associated with knee pain, FOF, and QoL among community-dwelling older adults in Northern Thailand.

## Methods

### Study design and sample

A cross-sectional study was conducted among community-dwelling older adults in Phu Kamyao district, Phayao Province, Northern Thailand. The data was collected during April and May 2024. A finite population proportion formula was used to determine the sample size [13,14]. The sample size was calculated by estimating the 5% margin of error ( $d$ ), 95% confidence interval ( $\alpha=0.05$ ),  $Z$  (0.975) was 1.960, and the prevalence ( $p$ ) of FOF was 35.8% in a previous study conducted in Thailand [15]. The size of the population ( $n$ ) was 6,389. Therefore, 369 participants were recruited for this study with a precision of 10%.

### Participants and criteria

The data were collected through in-person interviews by trained researchers. The participants of this study were adults aged 60 years or older who lived in Phu Kamyao district, Phayao Province, Northern Thailand. All participants who agreed to participate in this study were asked to sign the consent form. Older people who were not able to communicate, unable to walk independently, and had nervous system disorders were excluded. Data was collected at respondents' homes.

### Study variables and instruments

The questionnaire consisted of four parts as follows: (1) demographic characteristics, including sex, age, body mass index (BMI) (underweight ( $<18.5$  kg/m<sup>2</sup>), normal weight (18.5–24.9 kg/m<sup>2</sup>), and pre-obesity and obesity ( $\geq 25$  kg/m<sup>2</sup>)) [16], education, marital status, smoking, alcohol, history of falls in the previous year, and chronic diseases; (2) assessment for function and pain of the knee using the Oxford knee score (OKS); (3) assessment of FOF using the short version of falls efficacy scale international (short FES-I); and (4) QoL was assessed using World Health Organization quality of life-BREF-Thai (WHOQOL-BREF-Thai).

The OKS was used to assess pain and function of the knee, which consisted of 12 items on a five-point Likert scale (from 0 to 4; least to most difficulty or severity). The OKS was categorized into four groups based on pain and function of the knee: none OA of the knee (0–19 points), mild OA of the knee (20–29 points), moderate OA of the knee (30–39 points), and severe (40–48 points) [17-19].

The short version of FES-I was used to assess FOF in older adults, which consisted of seven items on a four-point Likert scale (1=not at all concerned, 2=somewhat concerned, 3=fairly concerned, and 4=very concerned). The FOF was categorized into three groups about falling: low concern (7–8 points), moderate concern (9–13 points), and high concern (14–28 points) [20,21].

The WHOQOL-BREF-Thai was used to assess QoL, which consisted of 26 items from 1 to 5 on a Likert scale (1=not at all, 2=little, 3=moderate, 4=good, and 5=very good). The QoL was categorized into four domains: physical health (7 items), psychological (6 items), social relationships (3 items), environmental (8 items), QoL, and general health. Overall, QoL was categorized into three groups about falling: low (26–60 points), moderate (61–95 points), and high (96–130 points) [22].

## Statistical analysis

Descriptive statistics were presented as mean, standard deviation (SD), frequencies, and percentages. The Chi-squared and Fisher's exact test were used to assess the association between independent variables (sex, age, BMI, education, marital status, smoking, history of falls in the previous year, and chronic diseases) and FOF. Pearson correlation analysis was used to assess the association between OA of the knee, QoL, and FOF. Multivariate linear regression analysis was performed to examine the association between OA of the knee, QoL, and FOF.

## Results

### Characteristics of the study population

The mean age of the participants was 69.4 years (SD=7.0), of which 215 (58.3%) were women. The mean BMI was 22.5 kg/m<sup>2</sup> (SD=4.0). Chronic disease and comorbidities examined were hypertension (41.7%), arthritis (18.2%), diabetes mellitus (15.2%), and osteoporosis (6.5%). Additionally, OA of the knee was severe (81.0%), moderate (11.1%), mild (6.2%), and very mild (1.6%). Overall, QoL was moderate (60.4%), high (39.0%), and low (0.5%) (**Table 1**).

**Table 1. Characteristics of respondents (n=369)**

Characteristics	Frequency (n)	Percentage
Sex		
Men	154	41.7
Women	215	58.3
Age		
<65 years	101	27.4
≥65 years	268	72.6
Body mass index (BMI)		
Underweight	57	15.4
Normal weight	209	56.6
Pre-obesity and obesity	103	27.9
Education		
≤Primary school	337	91.3
>Primary school	32	8.7
Marital status		
Single	17	4.6
Married	256	69.4
Others (widowed, divorced, separated)	96	26.0
Smoking		
No	305	82.7
Yes	64	17.3
Alcohol		
No	265	71.8
Yes	104	28.2
History of falls in the previous year		
No	322	87.3
≥1 time	47	12.7
Chronic diseases		
Hypertension		
No	215	58.3
Yes	154	41.7
Arthritis		
No	302	81.8
Yes	67	18.2
Diabetes mellitus		
No	313	84.8
Yes	56	15.2
Osteoporosis		
No	345	93.5
Yes	24	6.5
Osteoarthritis (OA) of the knee		
Very mild (0–19 points)	6	1.6
Mild (20–29 points)	23	6.2
Moderate (30–39 points)	41	11.1
Severe (40–48 points)	299	81.0

Characteristics	Frequency (n)	Percentage
Overall quality of life (QoL)		
Low (26–60 points)	2	0.5
Moderate (61–95 points)	223	60.4
High (96–130 points)	144	39.0

### Factors associated with fear of falling

The prevalence of FOF was 39.3% for low, 22.5% for moderate, and 38.2% for high concerns. Risk factors such as age ( $p=0.001$ ), marital status ( $p=0.015$ ), alcohol intake ( $p=0.011$ ), history of falls in the previous year ( $p<0.001$ ), hypertension ( $p=0.008$ ), arthritis ( $p<0.001$ ), and osteoporosis ( $p=0.001$ ) were associated with FOF (**Table 2**).

**Table 2. Factors associated with fear of falling (n=369)**

Characteristics	Fear of falling						p-value
	Low (39.3%)		Moderate (22.5%)		High (38.2%)		
	n=145	%	n=83	%	n=141	%	
Sex							0.567 <sup>a</sup>
Men	63	43.4	37	44.6	54	38.3	
Women	82	56.6	46	55.4	87	61.7	
Age (years)							0.001 <sup>a</sup>
<65 years	47	32.4	31	37.3	23	16.3	
≥65 years	98	67.6	52	62.7	118	83.7	
Body mass index (BMI) (kg/m <sup>2</sup> )							0.159 <sup>a</sup>
Underweight	23	15.9	6	7.2	28	19.9	
Normal weight	83	57.2	52	62.7	74	52.5	
Pre-obesity and obesity	39	26.9	25	30.1	39	27.7	
Education							0.240 <sup>a</sup>
≤Primary school	128	88.3	77	92.8	132	93.6	
>Primary school	17	11.7	6	7.2	9	6.4	
Marital status							0.015 <sup>b</sup>
Single	11	7.6	4	4.8	2	1.4	
Married	98	67.6	65	78.3	93	66.0	
Other (widowed, divorced, and separated)	36	24.8	14	16.9	46	32.6	
Smoking							0.704 <sup>a</sup>
No	117	80.7	69	83.1	119	84.4	
Yes	28	19.3	14	16.9	22	15.6	
Alcohol							0.011 <sup>a</sup>
No	107	73.8	49	59.0	109	77.3	
Yes	38	26.2	34	41.0	32	22.7	
History of falls in the previous year							<0.001 <sup>a</sup>
No	139	95.9	72	86.7	111	78.7	
≥1 time	6	4.1	11	13.3	30	21.3	
Chronic diseases							
Hypertension							0.008 <sup>a</sup>
No	98	67.6	47	56.6	70	49.6	
Yes	47	32.4	36	43.4	71	50.4	
Arthritis							<0.001 <sup>a</sup>
No	139	95.9	71	85.5	92	65.2	
Yes	6	4.1	12	14.5	49	34.8	
Diabetes mellitus							0.389 <sup>a</sup>
No	126	86.9	72	86.7	115	81.6	
Yes	19	13.1	11	13.3	26	18.4	
Osteoporosis							0.001 <sup>b</sup>
No	143	98.6	78	94.0	124	87.9	
Yes	2	1.4	5	6.0	17	12.1	

<sup>a</sup> Analyzed using Chi-square test; <sup>b</sup> Analyzed using Fisher's exact test

### Correlation osteoarthritis of the knee, quality of life, and fear of falling

Overall QoL ( $p<0.001$ ), physical health ( $p<0.001$ ), psychological health ( $p<0.001$ ), and social relationships ( $p<0.001$ ) were negatively correlated with FOF. OA of the knee was positively associated with FOF ( $p<0.001$ ) (**Table 3**).

Table 3. Correlation between osteoarthritis of the knee, quality of life, and fear of falling (n=369)

Variable	Mean±SD	Pearson correlation (r)	p-value
Osteoarthritis (OA) of the knee	11.2±10.8	0.752	<0.001
Overall quality of life (QoL)	92.3±11.3	-0.248	<0.001
QoL domains:			
Physical health	23.5±2.9	-0.439	<0.001
Psychological	23.2±3.3	-0.197	<0.001
Social relationships	9.4±1.9	-0.187	<0.001
Environment	29.1±4.1	-0.022	-0.667

### Multivariate data analysis

In multivariate linear regression analysis, OA of the knee was positively associated with increasing FOF ( $\beta$ : 0.361;  $p < 0.001$ ), while QoL was negatively associated with FOF ( $\beta$ : -0.064;  $p = 0.011$ ) after adjusting for age, gender, BMI, education, marital status, smoking, alcohol, history of falls, and chronic disease (hypertension, arthritis, diabetes mellitus, and osteoporosis) (Table 4).

Table 4. Multivariate linear regression analysis of osteoarthritis of the knee, quality of life, and fear of falling

Associated factors	R <sup>2</sup>	Adjusted R <sup>2</sup>	$\beta$	SE	FOF (p-value)
Osteoarthritis (OA) of the knee	0.613	0.599	0.361	0.022	<0.001
Overall quality of life (QoL)	0.342	0.318	-0.064	0.025	0.011

FOF: fear of falling; SE: standard error

Adjusted to age, gender, body mass index, education, marital status, smoking, alcohol, history of falls, and chronic diseases

## Discussion

The findings indicated that the prevalence of FOF among older adults was 39.3% for low, 22.5% for moderate, and 38.2% for high levels. These numbers are lower than the global mean prevalence of 49.6%, as reported in a systematic review and meta-analysis, and still in the range of 21.6% to 88.2% observed in Southeast Asia [9,23]. The prevalence of FOF in developing countries (53.4%) was higher than in developed countries (46.7%) [23]. The high prevalence in our study may be attributed to the high rates of chronic diseases, such as hypertension (41.7%), arthritis (18.2%), diabetes mellitus (15.2%), and osteoporosis (6.5%), which are known to increase FOF. Previous studies have reported that individuals with chronic diseases had a higher FOF than those without chronic diseases [3,24].

Additionally, our study showed a significant association between age, marital status, alcohol, history of falls, hypertension, arthritis, osteoporosis, and FOF. The present study is consistent with previous studies that also indicated that age, marital status, history of falls, drinking status, and chronic diseases were associated with a high FOF [25-27]. Several studies also have shown that other multiple risk factors contributed to the increasing FOF, such as females, lower education level, living alone, anxiety, low social support, deficits in balance control, environmental factors, cognitive impairment, and restrictions in activities of daily living [9,25-27]. A previous study found that the prevalence of high FOF was higher among older adults than younger adults [25]. People with multimorbidity and health problems were more likely to have a greater risk of FOF that might lead to future falls due to age-associated pathophysiological changes in all organ systems [23,24,28,29].

This study found that the prevalence of knee OA in older adults was highest in the severe category (81.0%), which aligns with a previous study in low-middle-income countries that also indicated the highest proportion was in the severe category (47%). While in high-income countries, the prevalence of knee OA was found to be the highest in the mild category (71%) [30]. The prevalence of OA in the knee at the severity levels was much higher in this study than in the previous one. Similarly, a study by Yahaya *et al.* has shown that the prevalence of OA in the knee was high in low-middle-income countries [31]. Importantly, WHO reported that OA was found in 73% of adults aged 55 and over, and 60% occurred in women [32]. The global prevalence of knee OA was 22.9% among people aged 40 years and over in 2020 [33]. The prevalence of knee OA was 19.2% in Asia, 15.8% in North America, 13.4% in Europe, and 4.1% in South America in 2020

[33]. OA is associated with age, female, genetics, obesity, diabetes, and joint injury [32]. It is important to note that these global and regional prevalence rates do not typically distinguish between different severities of OA. However, the high prevalence of severe OA knee (81.0%) identified in this study suggested a substantial burden of advanced disease in the population. This discrepancy may be attributed to various factors, including sociodemographic characteristics, genetic predispositions, obesity, diabetes, and joint injuries, all of which are recognized as causes and risk factors for OA.

This study found that OA of the knee was positively associated with increasing FOF. This finding aligns with a previous study that found OA were significantly associated with an increased risk of FOF [34]. Nonetheless, people who had a risk of falls or/and OA in older adults might have an adverse health outcome, which is less psychological well-being and a decreased QoL [34,35]. OA is the most common disease in older adults and results from the degenerative joint condition of the knee [32]. Older adults with knee OA have a higher risk of falling compared to older adults without knee OA, particularly among women [36,37].

Our study found that the overall QoL, physical health, psychological health, and social relationships were negatively associated with FOF. Previous studies found that lower levels of FOF were associated with increasing QoL [7,38]. FOF is an important psychological problem or emotional trait [7,8]. Thus, people with FOF are likely to suffer future falls in older age [39]. Additionally, FOF was associated with a reduction in physical and mental QoL that results from several factors, such as social isolation, physical frailty, and social frailty [38]. Thus, improving physical health, psychological health, and social relationships among community-dwelling older adults can help increase their QoL.

The limitation of the study is employing a cross-sectional design, which restricted the ability to infer causality between knee pain, QoL, and FOF. Longitudinal studies are needed to establish the temporal relationships and causative factors. This study also did not utilize risk measure analyses such as odds ratios, risk ratios, or prevalence ratios to better quantify these associations.

## Conclusion

This study identified several risk factors associated with FOF among community-dwelling older adults in Northern Thailand, including demographic characteristics (age and marital status), health status (alcohol intake and history of falls in the previous year), and chronic diseases such as hypertension, arthritis, and osteoporosis. FOF was positively associated with OA of the knee, indicating a higher likelihood of FOF in individuals with knee OA. Conversely, FOF was negatively associated with overall QoL, physical health, psychological health, and social relationships, demonstrating that higher levels of FOF correspond to poorer quality of life. These findings underscore the need for comprehensive prevention programs to reduce FOF among older adults, focusing on managing chronic conditions and improving overall health and social support to enhance QoL.

## Ethics approval

The study was approved by the Research Ethics Committee of the University of Phayao, Thailand (UP-HEC 1.2/064/66).

## Acknowledgments

The authors would like to thank the participants in this study.

## Competing interests

The authors declare no conflict of interest.

## Funding

This study received no external funding.

## Underlying data

All data underlying the results are available from the corresponding author on request.

## How to cite

Silangirn P, Chaichana K, Thummayot S, *et al.* Study of knee pain, fear of falling, and quality of life among community-dwelling older adults, Northern Thailand. *Narra J* 2024; 4 (2): e915 - <http://doi.org/10.52225/narra.v4i2.915>.

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