Frailty, Fear of Falling, and Quality of Life Among Community-Dwelling Older People

ความเปราะบาง ความกลัวการหกล้ม และคุณภาพชีวิตของผู้สูงอายุที่อาศัยอยู่ในชุมชน

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ABSTRACT

Background: Frailty and fear of falling (FOF) are significant concerns for older people, and potentially impact their quality of life (QOL). However, the effects of FOF in frailty on each domain of QOL remain unclear.

Objective: To compare sociodemographic, physical frailty, falls, FOF, and QOL between frailty and non-frailty (NF) and to determine whether FOF correlates with specific QOL domains bases on frailty status.

Methods: Three hundred community-dwelling people aged ≥ 65 years were stratified into frailty and NF (n = 150/group) based on Fried criteria. Falls and FOF were assessed by Falls Efficacy Scale-International. Health-related QOL was assessed by Thai version of World Health Organization QOL-Brief.

Results: The mean ages of frailty and NF groups were 78.4±7.1 and 70.6±4.2 years, respectively. The falls prevalence was significantly higher in frailty (43.3%) than in NF (29.3%). The FOF scale was significantly higher in frailty (45.0±13.4) compared with the NF (26.9±8.5). The mean of overall QOL in frailty (63.3±13.3) was significantly lower than in the NF (82.8±14.5). FOF significantly correlated with social (ρ = 0.276, p<0.001) and environmental (ρ = 0.170, p=0.038) QOL in the frailty, while FOF did not correlate with any QOL domain in the NF group.

Conclusion: Frailty with FOF may impact older people' interactions with the surrounding society and their living environment, such as safety house's environment, public health services, and transportation. These may provide useful information to health profession for improving the QOL of frail older people.

Keywords: frailty, fear of falling, quality of life, community-dwelling older people

บทคัดย่อ

ที่มาและความสำคัญ: ความเปราะบางและความกลัวการหกล้มเป็นปัญหาสำคัญสำหรับผู้สูงอายุ ซึ่งอาจส่งผลกระทบต่อคุณภาพชีวิตโดยรวม อย่างไรก็ตาม ผลกระทบของความกลัวการหกล้มในผู้สูงอายุที่มีความเปราะบางต่อคุณภาพชีวิตในด้านต่าง ๆ ยังคงไม่ชัดเจน

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วัตถุประสงค์: เพื่อเปรียบเทียบข้อมูลสังคมประชากรของอาสาสมัคร ความเปราะบางทางกาย การหกล้ม ความกลัวการหกล้มและคุณภาพชีวิตระหว่างกลุ่มที่มีภาวะเปราะบางกับกลุ่มที่ไม่มีภาวะเปราะบาง และเพื่อศึกษาว่าความกลัวการหกล้มมีความสัมพันธ์ต่อคุณภาพชีวิตเฉพาะด้านหรือไม่

วิธีการวิจัย: ผู้สูงอายุที่อาศัยอยู่ในชุมชนจำนวน 300 คน ที่มีอายุตั้งแต่ 65 ปีขึ้นไป แบ่งเป็นกลุ่มเปราะบางและไม่เปราะบาง (กลุ่มละ=150) ตามเกณฑ์ของ Fried ทำการบันทึกข้อมูลประวัติการหกล้มภายใน 6 เดือน และความกลัวการหกล้มโดยใช้แบบประเมิน Falls Efficacy Scale-International ฉบับภาษาไทย และข้อมูลคุณภาพชีวิตซึ่งประเมินโดย WHO-QOL-BREF-ฉบับภาษาไทย

ผลการวิจัย: ผลการศึกษานี้แสดงอายุเฉลี่ยของผู้สูงอายุในกลุ่มเปราะบาง (78.4±7.1 ปี) และกลุ่มที่ไม่เปราะบาง (70.6±4.2 ปี) โดยพบว่าจำนวนผู้ที่มีประวัติการหกล้มในกลุ่มเปราะบาง (43.3%) สูงกว่ากลุ่มที่ไม่เปราะบาง (29.3%) อย่างมีนัยสำคัญทางสถิติ คะแนนความกลัวการหกล้มในกลุ่มเปราะบาง (45.0±13.4) มีค่าสูงกว่ากลุ่มที่ไม่เปราะบาง (26.9±8.5) และค่าเฉลี่ยคุณภาพชีวิตโดยรวมของผู้สูงอายุในกลุ่มเปราะบาง (63.3±13.3) มีคะแนนต่ำกว่ากลุ่มที่ไม่เปราะบาง (82.8±14.5) อย่างมีนัยสำคัญทางสถิติ นอกจากนี้ ผลการศึกษายังรายงานว่า ผู้สูงอายุกลุ่มเปราะบางที่มีความกลัวการหกล้มมีความสัมพันธ์กับคุณภาพชีวิตทางด้านสังคม (ρ = 0.276, p<0.001) และด้านสิ่งแวดล้อม (ρ = 0.170, p=0.038) อย่างมีนัยสำคัญทางสถิติ ขณะที่ไม่พบความสัมพันธ์ระหว่างความกลัวการหกล้มต่อคุณภาพชีวิตในด้านต่าง ๆ ของกลุ่มที่ไม่เปราะบาง

สรุปผล: ผู้สูงอายุกลุ่มเปราะบางที่มีความกลัวการหกล้มอาจส่งผลกระทบต่อปฏิสัมพันธ์กับสังคมโดยรอบและสภาพแวดล้อมบริเวณที่อาศัยอยู่ เช่น ความปลอดภัยรอบบ้าน บริการสาธารณสุข และขนส่งสาธารณะ ผลจากการศึกษานี้ให้ข้อมูลที่เป็นประโยชน์สำหรับบุคลากรทางการแพทย์สามารถใช้เพื่อปรับปรุงคุณภาพชีวิต (QOL) ของผู้สูงอายุกลุ่มเปราะบาง

คำสำคัญ: ความเปราะบาง ความกลัวการหกล้ม คุณภาพชีวิต ผู้สูงอายุที่อาศัยอยู่ในชุมชน

Introduction

Frailty is a complex condition characterized by increased vulnerability and decreased physiological reserve in older people, often manifesting as reduced physical performance and difficulty executing daily activities. It arises from the cumulative effects of age-related deficits across multiple body systems and is a recognized predictor of adverse health outcomes.[1] Frailty is widely recognized as a common condition among older adults. Its presence significantly elevates their risk of various adverse outcomes, including disability, falls, fractures, hospitalization, and mortality.[1,2,3]

A substantial body of research consistently demonstrates that frail older people have a markedly greater risk of falls than non-frail older adults.[4,5] According to World Health Organization (WHO) data, falls constitute a primary cause of injury among older people, with incidences ranging from 28% to 35% in individuals aged ≥ 65 years, increasing to 32%–42% in those aged >70 years. The risk of falls correlates positively with age and frailty level.[6] The ramifications of falls are multifaceted and potentially severe, initiating a cascade of adverse outcomes, including physical impairments, muscular deconditioning, polypharmacy, functional disabilities, and increased susceptibility

to environmental hazards. Furthermore, falls frequently induce a fear of subsequent falls, known as fear of falling (FOF), potentially creating a cycle of recurrent incidents. Cumulatively, this sequence of events can contribute to elevated mortality among older people.[1,2]

Individuals with a history of falls often experience FOF.[7,8,9,10,11] Previous research has also demonstrated that frail older people have greater concerns about falling, as indicated by their higher scores on the Falls Efficacy Scale-International (FES-I), than non-frail older people.[2] Alternatively, a systematic review indicated that FOF may increase the risk of developing frailty in community-dwelling older people aged >60 years.[8] This evidence reveals a complex interplay among frailty, falls, FOF, and, ultimately, quality of life (QOL).[8,12,13,14]

Studies have shown that frailty is associated with lower QOL[15], and FOF plays a significant role in this.[13,16] Specifically, a greater FOF was associated with lower QOL, especially in women who have experienced falls.[9,10,16] This fear affects various aspects of QOL, including physical health, social interactions, and mental well-being.[9,10] Additionally, lower scores in the physical and mental domains of a QOL questionnaire were more significantly associated with a greater risk of poor QOL in frail than in non-frail individuals.[13]

In Thailand, research on older people living in semi-rural areas has provided valuable insights into the relationship between FOF and QOL.[17] Despite 70% of participants residing in secure households, a significant proportion (34%) reported at least one fall in the previous year. This highlighted that a stable living environment does not necessarily eliminate fall risk among older people. This study reported a mean FOF score of 26.97 ± 4.31, indicating a moderate to high level of FOF among participants. Notably, a specific FOF score of 9.88 ± 2.19 was recorded when using public transportation, suggesting that mobility and transportation safety were major concerns for older people. These findings emphasized the potential barriers that FOF imposes on independence and daily activities. Furthermore, two-thirds of the older people in the community reported having a moderate QOL.[17]

Recent research has identified several risk factors associated with frailty in older people aged ≥60 years, including advanced age, low body mass index (BMI), unemployment, fall history, greater FOF, and lower QOL.[18] Furthermore, the association between frailty and age is well-established, and the complex interplay between falls, FOF, and QOL in older people warrants further investigation. Notably, the unique effects of FOF on different QOL domains (e.g., physical, mental, social, and environmental) in frail older people remain unclear. Therefore, there remains a gap in our understanding of how frailty specifically mediates the relationship between FOF and QOL across different domains. Addressing this gap could provide crucial insights into how FOF impacts various aspects of QOL in frail older people, potentially informing the development of more targeted and effective interventions to enhance well-being in this vulnerable population.

In order to address these knowledge gaps, our study aims to (1) compare sociodemographic characteristics, physical frailty,

fall risk, FOF, and QOL between frail and non-frail older people and (2) investigate the correlation between FOF and QOL based on frailty status among community-dwelling older people. Our primary research question focused on how FOF uniquely affects different QOL domains in frail older people. We hypothesized that sociodemographic characteristics, physical frailty, fall risk, FOF, and QOL would differ significantly between frail and non-frail individuals and that relationships would exist between FOF and QOL domains in frail older people.

Methods

This descriptive cross-sectional study involved 300 older people aged ≥ 65 years who were recruited via convenience sampling from community-dwelling older people in Pathum Thani Province, Thailand. This sample size was determined based on fall data from a previous study.[5] Participants were all functionally independent and could communicate in Thai. None were diagnosed with Parkinson's or Alzheimer's disease. Participants signed an informed consent form before data collection. The study protocol was approved by the Human Research Ethics Committee of Chulalongkorn University, Thailand (approval number: 089/2020).

Frailty status: Participants were classified as frail and non-frail based on the Fried frailty phenotype.[19] Participants were classified as frail if they met three or more of the following criteria: (1) unintentional weight loss >4.5 kg over the past year; (2) reduced walking speed, defined as a time to walk 4.57 meters on a walkway within the slowest 20%, adjusting for sex and standing height; (3) muscle weakness; (4) self-reported exhaustion; (5) low physical activity. Muscle weakness was assessed using grip strength using the Takei Grip Strength Dynamometer (model T.K.K. 5401 GRIP-D, Japan) of the dominant hand while in a standing position. Participants were permitted to practice once before to data collection. The researcher instructed the participant, "Squeeze as much force as possible." The data was collected during two trials and subsequently averaged. A score of one point was assigned if the average hand grip strength fell under the lowest 20% based on sex and BMI. Exhaustion was assessed by asking the participant, "Do you feel so exhausted or extremely physically fatigued that you could not perform something afterward? or " Do you feel that all activities are done with difficulty?" during the past week (0 = rarely or none of the time [<1 day], 1 = some or a little of the time [1–2 days], 2 = a moderate amount of the time [3–4 days], or 3 = most of the time [>5 days]). Participants who answered with a score of two or three met the frailty requirements. The Thai version of the International Physical Activity Questionnaire-Short Form (IPAQ-SF) was used to assess physical activity levels due to its high test-retest reliability (intraclass correlation value, ICC = 0.69).[20] The IPAQ-SF consists of questions about the amount of time spent engaged in physical activity throughout the previous seven days. If the total Kcal per week was in the lowest 20% (male: <383 Kcal/week or female: <270 Kcal/week), one point was awarded.

Fear of falling (FOF): All participants were asked about the history of fall during the previous six months. A fall was defined as "an event which

results in a person coming to rest inadvertently on the ground or floor or other lower levels.[6] Fall history and fall frequency were collected by using the questionnaire. In addition, FOF was assessed using the Thai version of the FES-I, which has a reported Cronbach's alpha of 0.95 and a mean inter-item correlation among the 16 items of 0.67.[21] The maximum FES-I score is 64, and the following cutoffs are used to categorize FOF: 16–19 points, low concern; 20–27 points, moderate concern; 28–64 points, high concern.[21]

Quality of life (QOL): Quality of life was assessed using the Thai version of the World Health Organization Quality of Life Brief- Thai (WHOQOL-BREF-THAI)[22], a 26-question survey covering physical, mental, social, and environmental domains. The overall QOL score ranges from 26 to 130. The score cut-off for interpretation was categorized into numerous ranges: Scores ranging from 26 to 60 indicate a poor QOL; scores from 61 to 95 indicate fair QOL; scores between 96 and 130 indicate good QOL.[22] To assist participants who had difficulty reading or understanding, the researcher read the questionnaire aloud and provided clarifications as needed. Participants were encouraged to select their first instinctive response. Scores for each domain and the total score were then analyzed.

Statistical analysis

The data were analyzed using the SPSS Statistics software (version 22.0). The data distribution was assessed using the Kolmogorov–Smirnov goodness of fit test. Descriptive statistics were used to describe participants' sociodemographic and clinical characteristics. Continuous variables were presented as the mean ± standard deviation (SD). Body Mass Index (BMI) was normally distributed and compared between frail and non-frail groups using an independent t-test, whereas age, frailty scores, FES-I scores, WHOQOL-BREF-THAI scores were non-normally distributed and comparison between groups using a Mann–Whitney test. Categorical variables were presented as percentages and were compared between the two groups using a chi-square or Fisher's exact test based on the data distribution: sex, education, occupation before retirement, marital status, living status, underlying disease, surgery history, physical frailty items, fall history and frequency, level of QOL and Level of FOF concern. The strength and direction of relationships between FES-I scores and QOL domains were assessed separately in the frailty and non-frailty groups using Spearman's rank correlation coefficient (ρ) for non-parametric variables. A two-sided *p*-value of <0.05 was considered as statistically significant.

Results

The mean age was significantly higher in the frailty group than in the non-frailty group. The sociodemographic characteristics of the frailty and non-frailty groups were compared in Table 1. Sex, age, BMI, education, underlying diseases (excluding dyslipidemia), surgical history, and mean frailty scores differed significantly between groups ($p < 0.05$). The percentage of participants meeting all frailty phenotype criteria including weight loss, exhaustion, slowness, weakness, and low physical activity was significantly higher in the frailty group than in the non-frailty group

($p < 0.001$). However, occupation before retirement, marital status, and living status did not differ significantly between the frailty and non-frailty groups (Table 1).

Table 1 Characteristics of the participants between frailty and non-Frailty

Characteristics	Frailty (n=150)	Non-Frailty (n=150)	p-value
Gender, N (%)			
– Men	44 (41.5)	62 (58.5)	0.030[c]
– Women	106 (54.6)	88 (45.4)	
Age (year), mean±SD	78.4±7.1	70.6±4.2	< 0.001[b]
BMI (kg/m^2), mean±SD	23.5±4.0	25.1±4.0	0.001[a]
Education level, N (%)			< 0.001[c]
– No education	98 (65.3)	6 (4.0)	
– Elementary	51 (34.0)	84 (56.0)	
– High school or higher	2 (1.3)	60 (40.0)	
Occupation before retire, N (%)			0.851[c]
– Labor	64 (42.7)	64 (42.7)	
– Governor/worker/owner	70 (46.7)	67 (44.7)	
– Housewife	16 (10.7)	19 (12.7)	
Marital status, N (%)			0.531[c]
– Single	14 (9.3)	11 (7.3)	
– Married / Widow / Divorce	136 (90.7)	139 (92.7)	
Living status, N (%)			0.412[c]
– Alone	11 (7.3)	15 (10.0)	
– With Relatives	139 (92.7)	135 (90.0)	
Underlying disease, N (% yes)	149 (99.3)	135 (90.0)	< 0.001[c]
– Diabetes mellitus, N (% yes)	58 (38.7)	40 (26.7)	0.036[c]
– Hypertension, N (% yes)	124 (82.7)	101 (67.3)	0.003[c]
– Dyslipidemia, N (% yes)	90 (60.0)	80 (53.3)	0.294[c]
– Heart, N (% yes)	37 (75.3)	5 (3.3)	< 0.001[c]
Surgical history, N (% yes)	9 (6.0)	1 (0.7)	0.010[c]
Physical Frailty items, n (%)	3 items = 58 (38.7)	0 item = 65 (43.3)	< 0.001[c]
	4 items = 70 (46.7)	1 item = 64 (42.7)	
	5 items = 22 (14.7)	2 items = 21 (14.0)	
– Weight loss, n (% yes)	84 (56.0)	14 (9.3)	< 0.001[c]
– Exhaustion, n (% yes)	96 (64.0)	13 (8.7)	< 0.001[c]
– Slowness, n (% yes)	114 (76.0)	4 (2.7)	< 0.001[c]
– Weakness, n (% yes)	140 (93.3)	29 (19.3)	< 0.001[c]
– Low physical activity, n (%yes)	129 (86.0)	45 (30.0)	< 0.001[c]
Frailty score, mean±SD	3.8±0.7	0.7±0.7	< 0.001[b]

Note: BMI= body mass index; [a]Independent t-test; [b]Mann-Whitney U test; [c]Chi-square test.

Fall history, fall frequency, FES-I scores, and WHOQOL-BREF-THAI scores differed significantly between the frailty and non-frailty groups. Regarding fall history, a significantly higher percentage of participants in the frailty group (43.3%) had experienced a fall within the previous six months compared to the non-frailty group (29.3%). Additionally, the incidence of two or more falls was significantly higher in the frailty group (40.9%) than in the non-frailty group (2.3%) ($p < 0.001$). The mean FES-I scores for both fallers and non-fallers were significantly higher in the frailty group than in the non-frailty group. Furthermore, a significantly greater proportion of participants in the frailty group (89.3%) had a high FOF compared to the non-frailty group (39.3%) ($p < 0.001$), as presented in Table 2.

Table 2 Comparison of falls, fear of falling, and quality of life between frailty and non-frailty

Variables	Frailty (n = 150)	Non-Frailty (n = 150)	p-value
Fall history from last 6 months, N (%)			0.016[c]
– Fallers	66 (43.3)	44 (29.3)	
– Non-fallers	84 (56.7)	106 (70.7)	
Faller, frequency, N (%)			< 0.001[c]
– One fall	39 (59.1)	43 (97.7)	
– Two or more falls	27 (40.9)	1 (2.3)	
Fear of falling scale, mean±SD	45.0±13.4	26.9±8.5	< 0.001[b]
– Fallers	49..6±13.7	28.4±9.2	< 0.001[b]
– Non-fallers	40.3±12.4	32.5±13.4	0.002[b]
Level of FOF concern, N (%)			< 0.001[c]
– Low concern	2 (1.3)	36 (24.0)	
– Moderate concern	14 (9.3)	55 (36.7)	
– High concern	134 (89.3)	59 (39.3)	
Quality of life, mean±SD			
– Over all scores	63.3±13.3	82.8±14.5	< 0.001[b]
– Physical domain	15.9±3.7	22.1±3.6	< 0.001[b]
– Mental domain	15.4±3.7	20.0±4.1	< 0.001[b]
– Social domain	6.1±2.5	8.7±2.3	< 0.001[b]
– Environmental domain	20.6±5.2	25.6±5.4	< 0.001[b]
Level QOL, N (%)			< 0.001[c]
– Poor	78 (52.1)	15 (10.0)	
– Fair	71 (47.3)	99 (66.0)	
– Good	1 (0.7)	36 (24.0)	

Note: FES-I: Falls Efficacy Scale International, QOL: Quality of life, [b]Mann-Whitney U test, [c]Chi-square test.

In addition, total WHOQOL-BREF-THAI scores were significantly lower in the frailty group than in the non-frailty group. Moreover, the percentage of participants with poor QOL was significantly higher in the frailty group (52.1%) than in the non-frailty group (10.0%) at $p < 0.001$.

Furthermore, scores in the physical, mental, social, and environmental domains of the WHOQOL-BREF-THAI were significantly lower in the frailty group compared to the non-frailty group (Table 2).

The relationship between FOF and QOL domains based on frailty status. FOF was correlated with QOL domains in the frailty group. Specifically, FOF was significantly positively correlated with the social (ρ = 0.276, p < 0.001) and environmental (ρ = 0.170, p = 0.038) QOL domains. However, FOF was not correlated with any QOL domain in the non-frailty group (Table 3).

Table 3 Spearman's rho correlation between fear of fallings and quality of life among frailty

Variables	FOF in Frailty		FOF in Non-Frailty	
	rho (ρ)	p-value	rho (ρ)	p-value
Overall quality of life	0.115	0.162	0.020	0.807
Physical domain	-0.146	0.074	-0.135	0.100
Mental domain	0.109	0.184	0.017	0.837
Social domain	0.276**	<0.001	0.074	0.371
Environment domain	0.170*	0.038	0.097	0.235

Note: Spearman's rho correlation (rho, ρ), **significant at 0.01, *significant at 0.05, FOF=fear of falling

Discussion

This cross-sectional study classified 300 community-dwelling older people as frail or non-frail using the Fried frailty phenotype. The results showed that individuals in the frailty group were significantly older, more likely to be female, had lower BMI, less education, more underlying diseases, a higher frequency of surgical histories. Additionally, FES-I scores were higher in the frailty group than in the non-frailty group. Moreover, total WHOQOL-BREF-THAI scores, scores in the physical, mental, social, and environmental domains, were significantly lower in the frailty group compared to the non-frailty group. Furthermore, our findings highlighted a significant relationship between frailty and QOL, particularly in the social and environmental domains.

This finding was consistent with Hoogendijk et al., who reported that the prevalence of frailty increases with age.[23] Moreover, women were found to develop frailty more frequently than men, which could be attributed to hormonal changes after menopause. These changes led to poor health outcomes such as progressive muscle degeneration, sarcopenia, age-related muscle loss, and reduced physical function.[24] Individuals who only attended elementary school or did not complete any formal education might be less concerned about their health, reflecting physical and familial vulnerabilities. Low education levels could impact health literacy and awareness, leading to poor health outcomes that might be associated with an increased risk of falls and, ultimately, FOF.[25]

Our findings revealed significant differences in fall history, fall frequency, and FES-I scores between the frailty and non-frailty groups. Regarding fall history and frequency, a significantly higher percentage of participants in the frailty group (43.3%) had experienced a fall in the

previous six months compared to the non-frailty group (29.3%). Additionally, the incidence of two or more falls was higher in the frailty group (40.9%) than in the non-frailty group (2.3%). This could be because the frailty group in our study exhibited characteristics such as muscle weakness, loss of muscle mass (sarcopenia), and reduced strength, as well as multiple medications which contribute to instability and an increased likelihood of falls. The frailty people in this study might avoid performing daily activities that could pose a risk of falls. Typically, frailty in the older people, who were susceptible to impairments across multiple systems, affected their ability to perform activities of daily living.[7,8,11] Previous studies in frail older people identified weakness, impaired balance, and abnormal gait as major components of physical frailty and likely increased risk of falling. Frail older people tend to had a greater risk of falling because of sarcopenia, slow walking speed, and muscle weakness.[26]

This study showed that frail older people who experienced frequent falls had a high level of FOF. The total FES-I score was higher in the frailty group (45.0 ± 13.4) than in the non-frailty group (26.9 ± 8.5). From Table 2, the mean FES-I scores for both fallers and non-fallers in the frailty group were significantly higher compared to those in the non-frailty group. Our results suggested that the higher FOF scores were due to frailty rather than previous falls. Moreover, the percentage of participants who reported a high FOF was significantly higher in the frailty group than in the non-frailty group at $p < 0.001$ in Table 2. In addition, the mean FES-I score in non-frailty group of this study was consistent with study of Yodmai et al., who reported a mean FES-I score of 27.0 ± 4.3 in older people who had fallen at least once in the past year.[17]

Our study not only found that the mean total WHOQOL-BREF-THAI score was significantly lower in the frailty group (63.3 ± 13.3) than in the non-frailty group (82.8 ± 14.5), but also that the percentage of participants with poor QOL was higher in the frailty group (52.1%) compared to the non-frailty group (10.0%). This might be because the frailty group in our study predominantly consisted of individuals with lower income and education, who had higher rates of chronic disease and inadequate access to quality healthcare, housing, and supportive social environments. As a result, their QOL was diminished across physical, mental, social, and environmental dimensions compared to the non-frailty group, leading to an overall lower QOL. Meanwhile, some individuals in the non-frailty group within this community were middle-income, educated, aware of self-care, and had access to decent healthcare. Consequently, social support and a favorable living environment contributed to a moderate QOL in the non-frailty group. The participants in our non-frailty group primarily had moderate or fair QOL (66.0%). Additionally, WHOQOL-BREF-THAI scores in the physical, mental, social, and environmental QOL domains were significantly lower in the frailty group than in the non-frailty group (Table 2). Since QOL reflects an individual's perception of their physical, mental, and social well-being, it tended to decline in older people who experience recurrent falls. This decline was likely due to the development of FOF,

social isolation, and, subsequently, physical dependence.[13,14,18] In addition, a recent systematic review reported that FOF was related to limited activity and poor physical performance in women, leading to poor QOL.[7] Older people with high QOL scores were less likely to be frail than those with low QOL scores. A previous study reported that FOF was one risk factor for falling. Older people with a history of falling were affected twice by FOF compared to those without a history of falls. In addition, FOF was related to various adverse health outcomes, including daily physical limitations, slow movement, poor social participation, consequent falls, and poor QOL.[16] This result was relevant to the previous study, which reported that frail individuals had worse QOL than non-frail individuals among community-dwelling older people.[13,15] Since the older people identified as frail in our study exhibited weight loss, exhaustion, slowness, weakness, low physical activity, and recurrent falls, these issues, along with FOF, might adversely affect their QOL, consistent with Fried' s physical frailty criteria.[19,23] According to their age, older people with frailty were more prone to degenerative changes in various systems that would lead to reduced activities of daily life and QOL. This finding was consistent with a previous study that reported that older people experiencing FOF were more inclined to limit their activities. Those who frequently or consistently restricted their activities reported worse QOL.[9]

Our study found significant positive correlations between FES-I scores and WHOQOL-BREF-THAI scores in the social (ρ = 0.276, $p < 0.001$) and environmental (ρ = 0.170, $p = 0.038$) domains within the frailty group. Since, some quality of life questions in certain domains had positive meanings while others had negative meanings, this affected the total score of each domain, particularly in the social and environmental domains. This might result in a positive relationship between FOF and the social and environmental domains. In contrast, FOF was not correlated with any QOL domain in the non-frailty (Table 3). This might be because frailty in our study was associated with lower scores in the social and environmental domains, particularly among those with a high level of FOF. Our findings supported the idea that frail older people with a history of falls were concerned about falling while engaging in social activities. Furthermore, our findings demonstrated that frailty and FOF impact the environmental domain of QOL, including older people' satisfaction with transportation, daily security, and access to public health services. This finding was consistent with an earlier study that examined the impact of FOF on the health-related QOL of community-dwelling older people.[10] In addition, a previous study showed that social isolation was significantly associated with FOF-related activity restriction in older people (odd ratio = 1.70, 95% confidence interval = 0.82–3.55).[11] Older people exhibiting social frailty, characterized by reduced social engagement and increased solitude, demonstrated worse health-related QOL.[27]

Lastly, our findings showed no correlation between FOF and the mental or physical domains of QOL in the frailty group. This might be because the older people in our study typically lived with

their families, most of whom were couples. In addition, the mental health concerns of the older individuals in our study might not impact on the participants while living the community, in contrast to those who resided in nursing homes.[9] Our findings showed no relationship between FOF and the physical domain of QOL in the frailty group. However, the p-value approached statistical significance, suggesting that the relationship between FOF and the physical domain of QOL might become significant with a larger sample size. Therefore, further studies with a larger sample size are needed to confirm the significance of this relationship.

Clinical implications

Our findings highlight the importance of investigating the factors linking frailty, FOF, and the social and environmental domains of QOL. Enhancing these domains including home safety, accessibility of public health services, and transportation safety may contribute to an improved quality of life for individuals with frailty and FOF. A key suggestion from this study is that targeted interventions focusing on these domains within community-based initiatives could help improve overall health-related QOL. One strength of our study is its use of data from community-dwelling older people, unlike previous studies that primarily focused on those living in nursing homes or long-term care facilities.[9] Therefore, our findings better represent the experiences of frail older people living in the community.

Limitations

Our study had some limitations. Firstly, due to its cross-sectional design, it could not establish causal associations. Secondly, it was conducted only in a suburban community, so its findings may not be generalizable to other settings, such as urban or rural areas. Since this study collected data from older people in Rangsit and Khlong Luang Municipalities, both located in the capital city of Bangkok, the results may not be representative of older people in communities across the country. Therefore, prospective cohort studies should be conducted to identify the causation of frailty in older people. Additionally, future studies should be expanded to include various types of communities, including rural, suburban, and metropolitan areas, to better represent the general aging population. We propose studying different community types, as older people in affluent areas may exhibit physical and mental frailty rather than social and environmental frailty, while social and environmental frailty may be more prevalent in impoverished communities. Thus, it is recommended to collect data from diverse communities to capture frailty in its multiple dimensions. Consequently, conducting prospective cohort studies can help determine the risk factors that predict frailty in older people.

Conclusion

Our findings indicated that frailty and FOF related to the social and environmental domains of QOL. These insights suggested that FOF among frail older people might be associated with their social relationships, interactions with the

surrounding community, and living environment, including home safety, public health services, and transportation. Our findings provide healthcare professionals with valuable guidance for developing preventative strategies to enhance the QOL of frail older people.

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References

1. 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):1487-92.
2. Cooper R, Kuh D, Hardy R. Objectively measured physical capability levels and mortality: systematic review and meta-analysis. BMJ. 2010;341:c4467.
3. Xue QL. The frailty syndrome: definition and natural history. Clin Geriatr Med. 2011;27(1):1-15.
4. Ensrud KE, Ewing SK, Cawthon PM, Fink HA, Taylor BC, Cauley JA, et al. A comparison of frailty indexes for the prediction of falls, disability, fractures, and mortality in older men. J Am Geriatr Soc. 2009;57(3):492-8.
5. Ensrud KE, Ewing SK, Taylor BC, Fink HA, Cawthon PM, Stone KL, et al. Comparison of 2 frailty indexes for prediction of falls, disability, fractures, and death in older women. Arch Intern Med. 2008;168(4):382-9.
6. WHO Global report on falls prevention in older age. World Health Organization. 2007.
7. Schoene D, Heller C, Aung YN, Sieber CC, Kemmler W, Freiberger E. A systematic review on the influence of fear of falling on quality of life in older people: is there a role for falls?. Clin Interv Aging. 2019;14:701-19.
8. de Souza LF, Canever JB, Moreira BS, Danielewicz AL, de Avelar NCP. Association between fear of falling and frailty in community-dwelling older adults: A systematic review. Clin Interv Aging. 2022;17:129-40.
9. Xu D, Wang Y, Zhu S, Zhao M, Wang K. Relationship between fear of falling and quality of life in nursing home residents: The role of activity restriction. Geriatr Nurs. 2024;57:45-50.
10. Lee ES, Kim B. The impact of fear of falling on health-related quality of life in community-dwelling older adults: mediating effects of depression and moderated mediation effects of physical activity. BMC Public Health. 2024;24(1):2459.
11. Merchant RA, Chen MZ, Wong BLL, Ng SE, Shirooka H, Lim JY, et al. Relationship between fear of falling, fear-related activity restriction, frailty, and sarcopenia. J Am Geriatr Soc. 2020;68(11):2602-8.
12. Esbrí-Víctor M, Huedo-Rodenas I, López-Utiel M, Navarro-López JL, Martínez-Reig M, Serra-Rexach JA, et al. Frailty and fear of falling: The FISTAC study. J Frailty Aging. 2017;6(3):136-40.

13. Kojima G, Iliffe S, Jivraj S, Walters K: Association between Frailty and quality of life among community-dwelling older people: A systematic review and meta-analysis. J Epidemiol Community Health. 2016;70(7):716-21.
14. Patil R, Uusi-Rasi K, Kannus P, Karinkanta S, Sievänen H. Concern about falling in older women with a history of falls: associations with health, functional ability, physical activity and quality of life. Gerontology. 2014;60(1):22-30.
15. Papathanasiou IV, Rammogianni A, Papagiannis D, Malli F, Mantzaris DC, Tsaras K, et al. Frailty and quality of life among community-dwelling older adults. Cureus. 2021;1;13(2):e13049.
16. Prata MG, Scheicher ME. Relationship between fear of falling and quality of life in older women fallers fear of falling and quality of life in older. MOJ Gerontol Ger. 2017;1(5):128-31.
17. Yodmai K, Phummarak S, Sirisuth JC, Kumar R, Somrongthong R. Quality of life and fear of falling among an aging population in semi rural, thailand. J Ayub Med Coll Abbottabad. 2015; 27(4):771-4.
18. Uratcha Sadjapong, Pongsaton Silangirn, Keng Chaichana, Sakesun Thongtip. Malnutrition, fear of falling, and quality of life are associated with frailty in older adults. J Health Res. 2024;38(3):283-90.
19. Fried LP, Tangen CM, Walston J, Newman AB, Hirsch C, Gottdiener J, et al. Frailty in older adults: evidence for a phenotype. J Gerontol A Biol Sci Med Sci. 2001;56(3):M146-56.
20. Rattanawiwatpong P, Khunphasee A, Pongurgsorn C, Intarakamhang P. Validity and reliability of the Thai version of short format international physical activity questionnaire (IPAQ). J Thai Rehabil. 2006;16:147-60.
21. Thiamwong L. Psychometric testing of the falls efficacy scale-international (FES-I) in Thai older adults. Songkla Med J. 2011;29(6):277-87.
22. WHOQOL-BREF. Program on mental health world health organization Geneva, Switzerland: WHO. 1996.
23. Hoogendijk EO, Afilalo J, Ensrud KE, Kowal P, Onder G, Fried LP. Frailty: implications for clinical practice and public health. Lancet. 2019;12;394(10206):1365-75.
24. Khadilkar SS. Musculoskeletal disorders and menopause. J Obstet Gynaecol India. 2019; 69(2):99-103.
25. Eyigor S, Kutsal YG, Duran E, Huner B, Paker N, Durmus B, et al. Frailty prevalence and related factors in the older adult-FrailTURK project. Age (Dordr). 2015;37(3):9791.
26. Wilson D, Jackson T, Sapey E, Lord JM. Frailty and sarcopenia: the potential role of an aged immune system. Ageing Res Rev.2017;36:1-10.
27. Ko Y, Lee K. Social frailty and health-related quality of life in community-dwelling older adults. Int J Environ Res Public Health. 2022; 19(9):5659.