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REVIEW

Association Between Fear of Falling and Frailty in Community-Dwelling Older Adults: A Systematic Review

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Background/Objective: Fear of falling (FoF) and frailty are common problems in older adults. FoF can lead to self-imposed restriction of activities and then further decline in physical capacities that predispose older adults to frailty. Evaluating the association of these two geriatric syndromes may be the first step for understanding their complex relationship and might ultimately lead to establishing therapeutic goals and guiding treatments for older adults with frailty. This systematic review was conducted to provide evidence regarding the association between FoF and frailty.

Methods: All the articles that provided information on the association between FoF and frailty were selected from PubMed, Scopus, CINAHL, and EMBASE in search of relevant papers. Articles reporting information on the association between FoF (exposure) and frailty (outcome), with older adults (age ≥60 years) living in the community (ie, living either at home or in places of residence that do not provide nursing care or rehabilitation) were included. Only original articles with observational design (cross-sectional or longitudinal/cohort) were included. The methodological quality of included articles was evaluated independently by the two assessors through the Newcastle-Ottawa Scale (NOS) and the Joanna Briggs Institute (JBI) critical appraisal checklist for longitudinal and cross-sectional studies, respectively.

Results: The initial searches found 4,342 articles, of which 10 articles were included in this review: 7 cross-sectional and 2 longitudinal studies, and 1 study with cross-sectional and longitudinal analyses. The total sample was composed of 6,294 community-dwelling older adults (61.8% women). Among the longitudinal studies, adjusted odds ratios ranged from 1.18 (95% CI = 1.02; 1.36) to 9.87 (95% CI = 5.22; 18.68), while the adjusted odds ratios of the cross-sectional studies ranged from 1.04 (95% CI = 1.02; 1.07) to 7.16 (95% CI = 2.34; 21.89).

Conclusion: FoF increases the risk of frailty in community-dwelling older adults. The knowledge of this association is of utmost importance in clinical practice, since it can help health professionals in the development of rehabilitation, prevention, and health promotion protocols. In addition, these findings can contribute to the development of public health policies and actions aimed at reducing the FoF and consequently the frailty.

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Keywords: fear of falling, frailty, older adults, systematic review, geriatric syndromes

Introduction

Frailty is a serious public health problem in aging societies, affecting between 4.0% and 59.1% of community-dwelling older adults aged 65 years and over from the United States, Canada, Europe, Taiwan, and Australia.[1] In low- and middle-income countries, frailty prevalence ranges from 3.9% to 51.4% in individuals aged 60 years and over living in the community.[2] This complex and multidimensional syndrome is understood as a state of higher vulnerability to endogenous and exogenous stressors (eg, infection, injury, surgery, or psychosocial distress), as a result of age-related declines in function and reserve of various physiological systems, increasing the probability of adverse health outcomes.[3] A recent

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systematic review of 29 prospective studies showed that frail individuals had a significantly higher risk of falls, bone fractures, disability, dementia, hospitalization, and death.[4]

Some experts in geriatrics have also conceptualized frailty as a pre-disability state; however, it can co-exist with disability.[5,6] Other researchers consider frailty as an indicator of functional decline that represents a life stage between autonomous living and death.[4,7] Sociodemographic (advanced age, female sex, low education level, low income, living alone, and loneliness), clinical (multimorbidity, obesity, malnutrition, impaired cognition, depressive symptoms, and polypharmacy), lifestyle (physical inactivity, low protein consumption, smoking, and increased alcohol intake), and biological factors (inflammation, endocrine problems, and micronutrient deficits) are associated with onset or progression of frailty.[8,9] Studies have shown that all older adults are at risk of developing frailty; however, the risk is eminently greater among those with comorbidities, low socioeconomic position, poor diet, and sedentary lifestyles.[8]

Fear of falling (FoF) is another common problem in the older population. One of the concepts of FoF refers to low perceived self-efficacy or confidence at avoiding falls during essential, nonhazardous activities of daily living.[10] Prevalence rates for FoF in community-dwelling older adults range from 21.0% to 85.0% among fallers, and 33.0% to 46.0% among those with no history of falls.[11] FoF can be considered a protective response because it allows a person to be more cautious about her/his surroundings. However, when irrational and exaggerated, FoF can affect the person's physical and psychosocial well-being due to restriction or avoidance of activities.[12] In the long term, restriction of activities can lead to deconditioning, muscle weakness, and postural instability, which in turn can favor the occurrence of future falls.[13] Moreover, FoF has been linked to other negative consequences including disability for performing basic activities of daily living, reduced social interactions, depression, poor health-related quality of life, and all-cause mortality.[14–16]

The hypothesis of the present study is that FoF would lead to self-imposed restriction of activities and, then further decline in physical capacities (eg, conditioning, muscle strength, and balance), predisposing older adults to frailty. In other words, FoF would be a risk factor for frailty. To date, to the best of our knowledge, no systematic review focusing on the association between FoF and frailty has been conducted. Evaluating the association of these two geriatric syndromes may be the first step for understanding their complex relationship and might ultimately lead to establishing therapeutic goals and guiding treatments for older adults with frailty. Furthermore, summarizing the results about this topic raises the evidence level beyond findings derived from single previous studies, which can provide guidance to further research. Therefore, the present study aimed to systematically review the available literature on the association of FoF with frailty in community-dwelling older adults.

Methods

Protocol and Registration

The protocol of the present study was registered in the International Prospective Register of Systematic Reviews - PROSPERO (registration number CRD42021276775). This systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) recommendations.

Definition of Variables

Participants were classified according to their frailty status and FoF using any currently validated scale, physical tests, or measurements for identification of each condition.

Search Strategy

The searches were conducted in October 2021 in the PubMed, Scopus, CINAHL, and EMBASE databases (Appendix 1). The Medical Subject Headings (MeSH) were chosen, but when these could not be employed due to absence in the thesaurus or the excess of results inconsistent with the purpose of the study, the most common descriptors of articles with respect to the topic were used. In such cases, the search restriction was made to the descriptors, titles, and abstracts.

The search included as the first descriptor the participants (older adults OR older people OR elderly OR aged OR aging OR ageing OR older person). The second descriptor was FOF (fear-related activity restriction OR fear of falls OR

fear of falling OR fear OR fall-related OR self-efficacy OR balance confidence fear-associated OR related mobility restriction OR activity restriction OR fall-related efficacy OR falls-efficacy OR self-confidence). The third one was frailty (frail*).

Study Selection and Data Extraction

The selection of articles was carried out by two reviewers (L.F.S. and J.B.C.), independently and in two stages. First, the titles and abstracts of all identified articles were screened. Next, the articles were read in full. A third assessor review the data extraction (N.C.P.A.), and any disagreement was resolved through consensus.

Duplicate references in two or more bibliographic databases were excluded with the help of the bibliographic management program (Mendeley) and subsequently checked manually. The references lists of all selected articles were explored in order to identify other articles relevant to the objective of the review that had not been found by the electronic search.

The data of the selected articles were extracted and entered independently by the first two reviewers in a spreadsheet in the program Microsoft Excel 2010, and then compared for pairing and possible corrections. Information with regard to title, authors, year of publication, country as well as data on the study design, study sample, outcome, exposure, control variables, applied statistical analyses, and results of the investigated associations (magnitudes and respective 95% confidence intervals – 95% CI) were collected.

Eligibility Criteria

Articles reporting information on the association between FoF (exposure) and frailty (outcome), with older adults (age ≥ 60 years) living in the community (ie, living either at home or in places of residence that do not provide nursing care or rehabilitation) were included. Only original articles with observational design (cross-sectional or longitudinal/cohort) were included. No restrictions were done for language or year of publication. Theses, dissertations, and monographs were not included.

Articles that did not define frailty or assessed it only with a single symptom/measure (eg, only gait speed or grip strength), and did not report the association between FoF and frailty were excluded. Articles that included persons younger than 60 years, combined populations (ie, community-dwelling older adults and those receiving nursing care or rehabilitation), conducted with populations with a specific health condition (eg, stroke or hip fracture), used FoF and frailty as confounding variables, or did not perform quantitative analyses were also excluded.

Assessment of Risk of Bias

The methodological quality of included articles was evaluated independently by the two assessors (L.F.S. and J.B.C.) through the Newcastle-Ottawa Scale (NOS) and the Joanna Briggs Institute (JBI) critical appraisal checklist for longitudinal and cross-sectional studies, respectively. The NOS scale has 8 items evaluating four dimensions, including sample selection, sample representativeness, comparability, and outcome assessment. Each item is awarded a maximum of one star except for the domain of "comparability", which is awarded a maximum of two stars. More stars indicate a higher quality.[17]

The JBI critical appraisal checklist contains 8 items assessing sample selection criteria, subject description, exposure measurement, subject condition measurement, confounding factors identification, confounding factors control, outcome assessment, and statistical analysis. Each item is categorized as yes, no, unclear, or not applicable.[18] Any disagreement in quality assessment was resolved through consensus. For both study designs, articles scoring > 7 are considered at low risk of bias, scores of 5–7 indicate a moderate risk of bias, and scores of < 5 indicate a high risk of bias.

Results

The initial searches in the electronic databases identified 4,342 articles for review. A total of 4,271 titles was screened after 71 duplicates were removed. Then, 4,254 articles were excluded based on titles and abstracts, and 17 full-text articles were reviewed for eligibility. In the end, 10 articles met the eligibility criteria for literature synthesis (Figure 1).

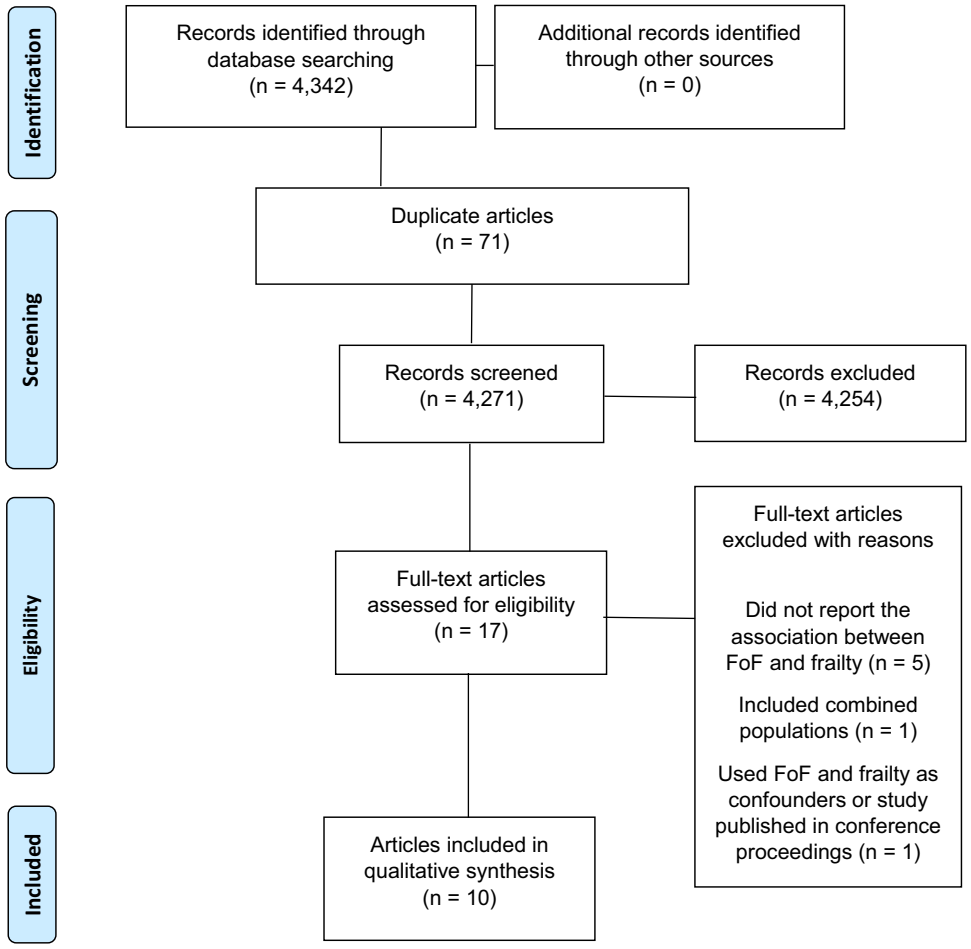

Figure 1 Study flowchart. Adapted from Page MJ, McKenzie JE, Bossuyt PM, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*. 2021;372:n71.[41]

Table 1 shows the characteristics of the included articles in the systematic review. Although there was no restriction regarding the year of publication of the articles, it is noted that 70% (n=7) of the articles were published in the last two years [2021: three articles (30%);[19–21] 2020: four articles (40%)[22–25]]; 2015, 2011, 1994: one article (10%) for each year.[26–28] Four studies were conducted in high income countries [Spain (n=1),[19] Japan (n=1),[24] Singapore (n=1),[22] and United States (n=1)],[28] five in upper-middle-income countries [(Brazil (n=1),[26] Turkey (n=2),[25,27] Taiwan (n=1),[21] China (n=1)],[20] and one study was conducted with older adults living in high (Canada) and upper-middle-income countries (Albania, Colombia, and Brazil).[23]

Seven studies had a cross-sectional design,[19–22,25–27] two were longitudinal studies,[23,28] and one study had longitudinal and cross-sectional analyses.[24] The sample size of the included articles ranged from 113 to 1,434 participants, totaling 6,294 older adults. The participants' age ranged from 64 to > 81 years (73.11 ± 2.29 years). Of the total sample, 61.8% were women and 38.2% were men. Overall, half of the studies considered two frailty groups (pre-frail and frail),[20,22,23,25,27] one study considered only isolated frailty group (frail),[24] and four studies did not provide any division according to frailty status.[19,21,26,28]

As regards the frailty identification, one-half of studies[22,23,25–27] used the Fried et al's scale.[29] One study[24] used at least one modified criterion of Fried et al's scale.[29] In addition, four studies used other tools to assess frailty: Short Physical Performance Battery,[19] Index Study of Osteoporotic Fractures,[21] Tilburg Frailty Indicator,[20] and physical test and measures.[28] Regarding the FoF assessment, four studies used the Falls Efficacy Scale-International (FES-I),[20,21,23,26] three studies used the Short FES-I,[19,21,24] and four studies used a self-report question.[22,25,27,28]

Table 1 Main Characteristics of the Included Studies in the Systematic Review

Study	Country	Study Design	Total Population	Sample Characteristics (Age and Sex)	Frailty Criterion	Prevalence		FoF Criterion (Categorization)	Prevalence		Adjustment Variables	Statistical Methods	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
						Frail	Pre-Frail		High FoF	Low FoF				
Öztürk et al. (2020)[25]	Turkey	Cross-sectional	1,021	Age 74.9 ± 6.9 Female 693 Male 328	Fried et al's scale	19.20%	42.10%	Self-reported question "Are you afraid of falling?"	-	44.60%	-	Multivariate logistic regression analysis	0.8 (0.4; 1.5)	-
Alcolea-Ruiz et al. (2021)[19]	Spain	Cross-sectional	189	Age 77 (73.0–80.0) Female 117 Male 72	Short Physical Performance Battery (SPPB)	-	-	Short FES-I	-	42.90%	-	Binary and multivariate logistic regression analysis	-	1.7 (1.3; 2.2)
Kuo et al. (2021)[21]	Taiwan	Cross-sectional	751	Age 73.6 ± 6.6 Female 477 Male 274	Index Study of Osteoporotic Fractures (SOF)	-	-	Short FES-I and FES-I	-	-	Sex, age, marital status, educational attainment, working status, living arrangement, body mass index, smoking, and drinking status	Multivariate logistic regression analysis	-	Short FES-I: Weight loss 1.092 (1.035; 1.152) Exhaustion 1.171 (1.115; 1.230) Incomplete five times sit to stand 1.155 (1.067; 1.250) Poor grip strength 1.100 (1.048; 1.154) Slow walking time 1.131 (1.076; 1.188) FES-I: Weight loss 1.041 (1.015; 1.067) Exhaustion 1.076 (1.052; 1.101) Incomplete five times sit to stand 1.071 (1.033; 1.111) Poor grip strength 1.047 (1.024; 1.071) Slow walking time 1.062 (1.038; 1.087)
Qin et al. (2021)[20]	China	Cross-sectional	158	Age 71.63 ± 7.98 Female 66 Male 92	Tilburg Frailty Indicator	60.10%	36.90%	FES-I	-	81.0%	Age, hospitalizations in the past year, fall history in the past 6 months, and the number of chronic diseases	Binary logistic regression analysis	-	7.160 (2.342; 21.894)

(*Continued*)

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Table 1 (Continued).

Study	Country	Study Design	Total Population	Sample Characteristics (Age and Sex)	Frailty Criterion	Prevalence		FoF Criterion (Categorization)	Prevalence		Adjustment Variables	Statistical Methods	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
						Frail	Pre-Frail		High FoF	Low FoF				
Kamide et al. (2020)[24]	Japan	Longitudinal and cross-sectional	339	Age 72.9 ± 4.8 Female 238 Male 101	Modified Fried et al's scale	10.0%	-	Short FES-I	-	-	Motor function (handgrip test, running time, sit and stand up from a chair test), psychological function (GDS-5), anthropometry (body mass index), disability in daily life activities, comorbidities, medications, history of falls in the last year, and pains.	Multivariate logistic regression analysis		Cross-sectional 1.16 (1.05; 1.29) Longitudinal 1.18 (1.02; 1.36)
Merchant et al. (2020)[22]	Singapore	Cross-sectional	493	Age 73 ± 8 Female 391 Male 102	Fried et al's scale	3.40%	47.90%	Self-reported question "Are you afraid of falling?"	-	69.20%	-	Bivariate and multivariate logistic regression analysis	2.17 (1.26; 3.73)	-
Curcio et al. (2020)[23]	Canada, Albania, Brazil, and Colombia	Longitudinal	1,434	Age 64–69: 808 Age 70–75: 626 Female 753 Male 681	Fried et al's scale	6.50%	45.70%	FES-I	75.20%	24.80%	-	Multivariate logistic regression analysis	12.4 (7.6; 20.1)	-
Akın et al. (2015)[27]	Turkey	Cross-sectional	906	Age 71.5 ± 5.6 Female 459 Male 447	Fried et al's scale	10.0%	45.6%	Self-reported question "FoF absent or present during the last year"	-	-	-	Univariate and multivariate logistic regression analysis	1.452 (1.029; 2.048)	-

Dias et al. (2011)[26]	Brazil	Cross-sectional	113	Age 74.5 ± 7.0 Female 96 Male 17	Fried et al's scale	-	-	FES-I	-	28.32%	-	ANOVA, CHAID method, model validation verified through splitfolds method	-	-
Arfken et al. (1994)[28]	United States	Longitudinal	890	Age 66–70: 243 Age 71–75: 240 Age 76–80: 203 Age >81: 204 Female 597 Male 293	Physical test and measures	-	-	Self-reported question "At the present time, are you very fearful, somewhat fearful or not fearful that you may fall (again)?"	46.61%	53.39%	Age and sex	Multivariate logistic regression analysis	-	Frailty impaired balance 4.44 (2.15; 9.17) Episode of near fall 3.61 (2.12; 6.13) Inability to walk 10 blocks 3.48 (1.99; 6.08) Requiring assistance to climb stairs ambulation 4.66 (2.62; 8.30) Vision limiting 4.79 (2.09; 11.01) Fair or poor self-rated health 3.72 (2.16; 6.40) Use of assistive device to ambulate 9.87 (5.22; 18.68)

Abbreviations: FoF, Fear of Falling; FES-I, Falls Efficacy Scale-International; OR, odds ratio; ANOVA, analysis of variance; CHAID, Chi-Square Automatic Interaction Detection.

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Table 2 Quality Assessment of Longitudinal Studies (n=3) Using the Newcastle-Ottawa Scale (NOS)

Source	Criteria								
	Representation of the Exposed Cohort	Selection of the Non-Exposed Cohort	Ascertainment of Exposure	Demonstration That Outcome of Interest Was Not Present at Start of Study	Comparability of Cohorts on the Basis of the Design or Analysis	Assessment of Outcome	Follow-Up Was Long Enough for Outcomes to Occur	Adequacy of Follow-Up of Cohorts	Total Score
Kamide et al. (2020)[24]	★		★	★	★	★			5
Curcio et al. (2020)[23]	★		★	★		★	★		5
Arfken et al. (1994)[28]	★			★	★★		★		5

The unadjusted odds ratio (OR) of the association between FoF (exposure) and frailty (outcome) was 12.4 (95% CI=7.6; 20.1)[23] and the adjusted ORs varied from 1.18 (95% CI=1.02; 1.36)[24] to 9.87 (95% CI=5.22; 18.68)[28] for longitudinal studies; while for cross-sectional studies the unadjusted ORs ranged from 0.8 (95% CI=0.4; 1.5)[25] to 2.17 (95% CI=1.26; 3.73)[22] and the adjusted ORs ranged from 1.04 (95% CI=1.02; 1.07)[21] to 7.16 (95% CI=2.34; 21.89).[20] Dias et al's[26] study did not present the OR values. Of the five studies that presented the adjusted OR,[19–21,24,28] one study did not report the adjustment variables.[19] Among the adjustment variables reported, the most common were sex, age, comorbidities, history of falls in the last year, and body mass index.

Table 2 shows the quality analysis for longitudinal studies. All studies scored 5 points, indicating a moderate risk of bias. The study by Kamide et al[24] lost points because it did not present the selection of the unexposed cohort, had a short follow-up period (1 month), and presented a sample loss of about 50% of the participants. The study by Curcio et al[23] scored 5 points because the authors did not describe the selection of the unexposed cohort, did not use adjustment variables in the data analysis, and presented a sample loss of about 20% of the participants. Arfken et al's[28] study did not inform the selection of the unexposed cohort, did not state whether there was sample loss over the follow-up period, and did not use a standardized scale for assessing FoF.

Regarding cross-sectional studies, the quality of the studies ranged from 3 (high risk of bias) to 8 (low risk of bias). Öztürk et al's[25] study scored 3 points, as it did not present inclusion criteria, the study setting and participants' characteristics were not described in detail, the exposure measurement was not reliably evaluated, and adjustment variables were not used. The studies by Akin et al[27] and Dias et al[26] scored 5, while the studies by Alcolea-Ruiz et al[19] and Merchant et al[22] scored 6, and Kuo et al[21] scored 7. The studies by Kamide et al[24] and Qin et al[20] presented the maximum score on the scale. More details on the methodological quality of included cross-sectional studies can be seen in Table 3.

Discussion

This study aimed to systematically review the available literature on the association between FoF (exposure) and frailty (outcome) in community-dwelling older adults. Most studies (longitudinal and cross-sectional) analyzed in this systematic review identified positive associations between the two geriatric syndromes. Specifically, two longitudinal and four cross-sectional studies presented significant adjusted ORs demonstrating an association between these variables. It is also noteworthy that most studies included in this review had a cross-sectional design and presented a considerable discrepancy in the methodological quality, with scores ranging from 3 (high risk of bias) to 8 (low risk of bias).

Regarding the longitudinal studies, adjusted ORs ranged from 1.18 (95% CI=1.02; 1.36)[24] to 9.87 (95% CI=5.22; 18.68),[28] while adjusted ORs of the cross-sectional studies ranged from 1.04 (95% CI=1.02; 1.07)[21] to 7.16 (95%

Table 3 Quality Assessment of Analytical Cross-Sectional Studies (n=8) Using the Joanna Briggs Institute (JBI) Critical Appraisal Checklist

Source	Criteria								
	Were the Criteria for Inclusion in the Sample Clearly Defined?	Were the Study Subjects and the Setting Described in Detail?	Was the Exposure Measured in a Valid and Reliable Way?	Were Objective, Standard Criteria Used for Measurement of the Condition?	Were Confounding Factors Identified?	Were Strategies to Address Confounding Factors Stated?	Were the Outcomes Measured in a Valid and Reliable Way?	Was Appropriate Statistical Analysis Used?	Total Score
Öztürk et al. (2020)[25]	No	No	No	Yes	No	No	Yes	Yes	3
Alcolea-Ruiz et al. (2021)[19]	Yes	Yes	Yes	Yes	No	Yes	No	Yes	6
Kuo et al. (2021)[21]	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	7
Qin et al. (2021)[20]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8
Kamide et al. (2020)[24]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8
Merchant et al. (2020)[22]	Yes	No	Yes	Yes	No	Yes	Yes	Yes	6
Akın et al. (2015)[27]	Yes	Yes	No	Yes	No	No	Yes	Yes	5
Dias et al. (2011)[26]	Yes	Yes	Yes	Yes	No	No	Yes	No	5

CI=2.34; 21.89).[20] The large variation in the ORs observed among the included studies may be related to racial, demographic, anthropometric, socioeconomic, and cultural differences in the populations studied, being that four studies were conducted with participants from Europe, four from Asia, two from North America, and two from South America. Another issue involves the methodological aspects of the studies, such as different instruments used to assess frailty and FoF and different statistical analyses performed, which when adjusted considered different confounding variables. Furthermore, it should be noted that only the study by Öztürk et al[25] found no significant association between the variables. According to the authors, the lack of association between these conditions is because common diseases in older adults, such as frailty and sarcopenia, have a bidirectional relationship with the FoF, generating a vicious cycle, which makes it difficult to establish an association.[25]

Among the ten studies analyzed in this systematic review, one study showed no OR,[26] four studies presented only crude OR,[22,23,25,27] one study presented adjusted OR without reporting the adjustment variables,[19] and four studies presented adjusted OR with the adjustment variables.[20,21,24,28] This considerably limited the interpretation of the findings. Among the adjustment variables included in the studies, sex, age, comorbidities, history of falls in the past year, and body mass index were the most commonly used. MacKay et al,[30] in a recent scoping review, observed that female sex, history of falls, low physical performance, and depressive symptoms were the factors most associated with FoF. This finding reinforces the importance of including these variables in association models encompassing the FoF variable.

The mechanisms by which FoF can lead to frailty in older adults have been widely studied.[19,21–27,31] Among them, it should be noted that older adults with FoF may present exacerbated concern about suffering falls, causing self-imposed restriction in performing activities of daily living,[32] which in turn leads in the long term to decline in physical abilities (eg, reduced muscle strength, balance and mobility deficits, and physical deconditioning), thus increasing the risk for the development of other negative health conditions, such as sarcopenia and frailty.[22] Corroborating this hypothesis, Auais et al[33] showed that a one-point increase in the FES-I scale was associated with a 4% higher risk of mobility disability (95% CI=1.02; 1.05) and a 3% higher risk of developing poor physical performance (95% CI=1.01; 1.05) after a two-year follow-up. The authors pointed that reduced mobility, as well as poor physical performance, may be predisposing factors for frailty.

Previous study has also shown that self-imposed restriction in activities of daily living due to FoF is related to decreased energy expenditure in older adults, contributing to intramuscular fat accumulation.[32] Intramuscular adipose tissue acts in the release of pro-inflammatory cytokines, such as TNF- α, IL-6, C-reactive protein, as well as promoting increased levels of leukocytes and fibrinogen, which contributes to inflammatory conditions involved in the frailty etiopathogenesis.[34,35] Increased levels of pro-inflammatory cytokines further contribute to muscle protein degradation and affect metabolic pathways important in regulating homeostasis, which results in reduced muscle strength and proprioception, favoring the onset of frailty in older adults.[36] Moreover, Rochat et al[37] demonstrated that FoF-related activity restriction is associated with changes in gait, such as reduced speed, which is one of the frailty phenotype criteria proposed by Fried et al.[29]

Although the evidence in the present review is not unanimous about the association between FoF and frailty, the results of this study demonstrate the importance of early identification of older adults with FoF, because this geriatric syndrome would be a factor associated with frailty. Although there are different screening tools to identify the frailty syndrome, some instruments have been most frequently used in clinical research, such as the Fried et al's[29] scale.[22,23,25–27] However, other tools can also be used, such as the Tilburg Frailty Indicator[20] and the Short Physical Performance Battery.[19] The Tilburg Frailty Indicator is a multidimensional questionnaire of frailty assessment that has higher reliability and validity compared to 38 instruments used to assess frailty, including the Fried et al's[29] scale.[38] The Short Physical Performance Battery, on the other hand, is an easy-to-apply tool to verify older adults' functional capacity and is considered by some authors as just a complementary tool in tracking frailty in older adults.[39]

The differences in definitions of frailty and FoF, assessment tools, participants' characteristics, and statistical methods made it impossible to perform pooled estimates (ie, meta-analysis). Another limiting aspect concerns the absence of the OR in the study by Dias et al,[26] which may have been different from the range observed in other studies. In addition, most of the evidence included in this review comes from cross-sectional studies. Thus, the direction of the associations (ie, causality) cannot be determined.

As for the strengths of this study, we highlight the broad literature search in several databases, which increased the chance of identifying relevant studies in this field of knowledge, as well as the comprehensiveness of the sampling, including participants from different continents, cultures, and health perception, enabling a global view of the association between these two geriatric syndromes. Moreover, our systematic review provides for the first time an overview of the available evidence on the association between FoF and frailty in community-dwelling older adults. It is recommended that future research be conducted to determine the association between frailty (exposure) and FoF (outcome), as the literature suggests the existence of a bidirectional relationship between the two conditions.[40] Future research should also present crude and adjusted ORs in order to reduce the risk of bias. Furthermore, further longitudinal research correcting the methodological shortcomings presented in the studies included in this review is highly recommended.

Conclusion

Longitudinal and cross-sectional evidence shows that FoF is associated with frailty in community-dwelling older adults. The knowledge of this association is important for clinical practice to assist health professionals in the development of early screening protocols for frailty, as well as rehabilitation, prevention, and health promotion strategies. Furthermore, it can contribute to prevention and health education programs aimed at reducing the FoF and, consequently, the development of frailty and its negative outcomes.

Disclosure

The authors report no conflicts of interest in this work.

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