ANATOL J FAMILY MED
The Anatolian Journal of Family Medicine

Original Article

DOI: 10.5505/ajfamed.2025.47955
AJFAMED 2024;7(3):102–107

Evaluation of Knee Functionality and Frailty in Individuals 65 Years and Older in Primary Care: A Cross-Sectional Study

Esranur Yayın,[1] Hasan Esad Yayın[2]

[1]Baglar Family Health Center, Tokat, Türkiye
[2]Artova Family Health Center, Tokat, Türkiye

ABSTRACT

Objectives: The aim of this study was to investigate the relationship between knee functionality and frailty in individuals aged 65 years and older.

Methods: Participants aged 65 years and older registered at the Family Health Center Unit were included in this cross-sectional study. The patients were administered a sociodemographic data questionnaire, the Lysholm knee scoring scale, and the fatigue, resistance, aerobics, illnesses, and weight loss (FRAIL) frailty scale during face-to-face interviews.

Results: The study was conducted with 122 participants whom 74 (60.7%) were male. The frequency of frailty was 32 (26.2%) and the frequency of frailty pre-frail was 43 (35.2%). There was a relationship between FRAIL score with age and body mass index (BMI) (r=0.326 and p=0.001 for age, r=0.202 and p=0.020 for BMI). While 23 (71.9%) of the women were frail and 20 (46.5%) were pre-frail, 9 (28.1%) of the men were frail and 23 (53.5%) were pre-frail (p=0.001). There was a relationship between Lysholm scores and FRAIL total scores (r=−0.819 and p=0.001).

Conclusion: Loss of knee functionality may increase frailty. Therefore, evaluating knee joint functionality may be useful in frailty assessment in elderly patients.

Keywords: Aged, frailty, knee

Please cite this article as:
Yayın E, Yayın HS. Evaluation of Knee Functionality and Frailty in Individuals 65 Years and Older in Primary Care: A Cross-Sectional Study. AJFAMED 2024;7(3):102–107.

Address for correspondence:
Dr. Esranur Yayın. Baglar Family Health Center, Tokat, Türkiye
Phone: +90 535 571 77 77
E-mail: esranuryayin@gmail.com

Received Date: 02.09.2023
Revision Date: 18.10.2024
Accepted Date: 20.01.2025
Published online: 27.01.2025

Anatolian Journal of Family Medicine - Available online at www.AJFAMED.org

OPEN ACCESS

INTRODUCTION

The world's population is aging rapidly.[1] In 2004, there were 461 million people over the age of 65; this number reached 2 billion in 2020. Because it is undeniable that the world is aging rapidly, it is increasingly important for public health to focus on problems that occur or may occur with aging. Frailty is defined as a syndrome of physiological decline associated with aging and characterized by a marked vulnerability to adverse health outcomes. The frail elderly are more susceptible to stressors, such as acute illness, surgery, multiple medications, and others than younger or more vigorous elderly people. While there are many instruments that can be used to determine frailty, studies have shown that it increases mortality and morbidity, leads to falls and concomitant hip fractures, and increases and prolongs hospitalization.[2] The modern healthcare system focuses on treating single-organ dysfunction and disease. However, many older people have multiple organ problems. Frailty is a practical, unifying concept in the care of older patients that leads to a more holistic view of patients and their situations. Awareness and recognition of frailty and related risks by healthcare providers will definitely improve care for this highly vulnerable patient group. According to numerous population-based studies, the prevalence of frailty varies over a wide range. The results vary according to the assessment method used, the

population of the study, and income levels. According to a systematic review of 15 studies and 44.894 patients in 2012, the prevalence was 9.9%.[3] In the Survey of Health, Aging, and Retirement (SHARE) study, conducted in Europe using eight measures, the prevalence ranged from 6% to 44%.[4] Frailty is observed more frequently in studies conducted in Turkey. Elbi and Özyurt, İlhan and Bakkaloğlu, observed the prevalence of frailty to be 64.5% and 63.2%, respectively, in their studies on the elderly living in a community.[5,6] According to data in the 2019 Global Burden of Disease study, osteoarthritis is the most important cause of physical disability in the elderly, and the most common form is knee gonarthrosis, with a frequency of 71%.[7] The knee joint is an important factor in maintaining mobility. Age is the factor that most significantly increases the risk of osteoarthritis, not only in the knee joint but in all joints.[8] There are many scales and methods for evaluating knee functionality. The Lysholm knee scale, first published in 1982, was developed to determine the functional status of patients with anterior cruciate ligament injuries in the knee.[9] It was later shown to be useful in many other knee complaints, injuries, and diseases. Therefore, it is not disease-specific and can be used to evaluate various knee disorders. The fatigue, resistance, aerobics, illnesses, and weight loss (FRAIL) frailty scale can be applied in a short time, especially in family medicine, which is often the first place patients consult, and does not require additional measuring, by health professionals. The scale has five components: Fatigue, resistance, ambulation, illness, and weight loss.[6] For fatigue, the patient is subjectively questioned about the frequency of feeling tired in the past month; for resistance, the patient is questioned about difficulty in climbing stairs; for ambulation, the patient is questioned about walking a few hundred meters without difficulty; and for illness, the patient is questioned about chronic diseases and weight loss of more than 5% in a year. Frailty and pre-frailty symptoms can be detected more frequently, especially in the geriatric population where knee functions are reduced and symptoms such as fatigue, decreased resistance, and difficulty in the movement are at the forefront.

This study aimed to investigate the relationship between knee functionality and frailty in individuals aged 65 years and older.

METHOD

The study was conducted at Artova Family Health Center between August 01, 2022, and September 01, 2022. Patients aged 65 and over who applied to the family medicine outpatient clinic were included in the study. Participants who were bedridden, with body mass index (BMI) ≥40, and those who had undergone knee and/or hip surgery were excluded from the study.

From a total population of 579 patients aged 65 years and over registered in a Family Medicine Unit, the minimum sample size was calculated as 111 with a frailty prevalence of 9.9%, 95% confidence interval, and 5% margin of error.[3] The study was completed with 122 patients.

Demographic characteristics, the FRAIL scale, and the Lysholm scores of the participants were evaluated. Data were collected from patients who gave verbal consent using face-to-face interviews to answer questionnaires. Frailty status was taken as the dependent variable and demographic data and Lysholm scores as independent variables.

Patients between the ages of 65 and 74 years as youngest-old, those between ages 75 and 84 years as middle-old, and those aged over 85 years as oldest-old were considered. The five-item FRAIL scale was used for screening for frailty.[6] There are five components: Fatigue, resistance, ambulation, illness, and loss of weight. Scale scores range from 0 to 5 (1 point for each component) and represent vigorous (0), pre-frail (1–2), and frail (3–5) health status. The Lysholm scale was used for determination knee functionality.[9] Possible score range: 0–100, where 100 means no symptoms or disability. Scores are categorized as excellent (95–100), good (84–94), fair (65–83) and poor (≤64).

The IBM SPSS Statistics v.22 package program was used for statistical analyses. The conformity of the parameters to normal distribution was evaluated by Kolmogorov-Smirnov and Shapiro-Wilks tests. Data were evaluated using descriptive statistics such as frequency, percentage, mean, standard deviation, median, and interquartile range. In comparing quantitative data, the One Way Anova test was used to compare normally distributed parameters between groups and the Tukey Honestly Significant Difference test was used to determine the group causing the difference. On the other hand, the Kruskal–Wallis test and Mann–Whitney U test were used to determine abnormally distributed parameters between groups. Fisher's exact test and the Chi-square test were applied for scale scores. Spearman's correlation test was used for the correlation between Lysholm and FRAIL, and Pearson's correlation test was used to determine their correlation with age and BMI. Statistical significance was accepted as $p<0.05$.

RESULTS

The study was conducted with 122 patients and the demographic characteristics of the participants are summarized in Table 1.

Table 1. The demographic characteristics of the participants

	Mean±SD
Age (years)	73.0±6.8
BMI (kg/m^2)	27.0±3.8
	n (%)
Age groups	
Youngest-old	75 (61.5)
Middle-old	35 (28.7)
Oldest-old	12 (9.8)
Gender	
Male	74 (60.7)
Female	48 (39.3)
Smoking	
Yes	13 (10.7)
No	80 (65.6)
Former smoker	29 (23.4)
Alcohol	
Yes	14 (11.5)
No	93 (76.2)
Former user	15 (12.3)

BMI: Body mass index.

Of the participants, 32 (26.2%) were frail, 43 (35.2%) were pre-frail, and 47 (38.5%) were vigorous. The demographic characteristics according to frailty status are summarized in Table 2.

When the subgroups of the fragility scale were evaluated, 26 (21.3%) of the participants stated that they were all of time fatigue, 62 (50.8%) had resistance, 40 (32.8%) had ambulation, 24 (19.7%) had no disease, and 23 (19.7%) had more than 5% weight loss. Subheadings of FRAIL according to gender are summarized in Table 3.

There was a relationship between FRAIL score with age and BMI (r=0.326 and p=0.001 for age, r=0.202 and p=0.020 for BMI).

There was an inverse and strong relationship between Lysholm scores and FRAIL total scores (r=−0.819 and p=0.001). Especially, there was a relationship between the Lysholm score and the score of the first three questions of the FRAIL scale (r=−0.834 and p=0.001).

While a relationship was found between Lysholm score and age, no relationship was found between Lysholm score and BMI (r=−0.324 and p=0.001 for age, r=−0.173 and p=0.056). The demographic characteristics according to the Lysholm Score are summarized in Table 4.

Table 2. The demographic characteristics according to frailty status

	Frailty			p
	Vigorous (n=47)	**Prefrail (n=43)**	**Frail (n=32)**	
Age (years)	70.1±5.1	74.3±7.3	75.6±6.9	0.001*
BMI (kg/m^2)	26.6±3.2	26.5±4.6	28.3±3.3	0.077*
Age groups				
Youngest-old	39 (83.0)	21 (48.9)	15 (46.9)	0.001†
Middle-old	7 (14.9)	17 (39.5)	11 (34.4)	
Oldest-old	1 (2.1)	5 (11.6)	6 (18.7)	
Gender				
Male	42 (89.4)	23 (53.5)	9 (28.1)	0.001‡
Female	5 (10.6)	20 (46.5)	23 (71.9)	
Smoking				
Yes	9 (19.1)	2 (4.7)	2 (6.3)	0.001†
No	18 (38.3)	34 (70.1)	28 (87.4)	
Former smoker	20 (42.6)	7 (16.2)	2 (6.3)	
Alcohol				
Yes	11 (23.4)	1 (2.3)	2 (6.3)	0.001†
No	26 (55.3)	38 (88.4)	29 (90.6)	
Former user	10 (21.3)	4 (9.3)	1 (3.1)	

BMI: Body mass index.
Data is presentes as mean±standard deviation and n (%).
*Oneway ANOVA test; †Fisher's Exact test; ‡Chi-square test.

Table 3. Subheadings of FRAIL according to gender

	Male (n=74)	Female (n=48)	p
Fatigue			
All of the time	11 (14.9)	15 (31.3)	0.005*
Most of the time	7 (9.5)	10 (20.8)	
Sometimes	28 (37.8)	18 (37.5)	
Rarely	10 (13.5)	3 (6.2)	
Never	18 (24.3)	2 (4.2)	
Resistance			
Yes	24 (32.4)	38 (79.2)	0.001†
No	50 (67.6)	10 (20.8)	
Ambulation			
Yes	15 (20.3)	25 (52.1)	0.001†
No	59 (79.7)	23 (47.9)	
Illness			
None	16 (21.6)	8 (16.7)	0.395‡
One	21 (28.4)	11 (22.9)	
Two	19 (25.6)	10 (20.8)	
Three	13 (17.6)	11 (22.9)	
Four	4 (5.4)	3 (6.3)	
Five	1 (1.4)	4 (8.3)	
Six	0 (0.0)	1 (2.1)	
Loss of weight			
5% or more	9 (12.2)	15 (31.2)	0.018†
<5%	65 (87.8)	33 (68.8)	

*Chi-square test; †Continuity (yates) correction test; ‡Fisher's Exact test.

Table 4. The demographic characteristics according to the Lysholm score

	Lysholm score	p
Age groups		
Youngest-old	91.0 (34.0)	0.004*
Middle-old	70.0 (53.0)	
Oldest-old	67.5 (72.0)	
Gender		
Male	94.0 (22.0)	0.001†
Female	59.5 (47.0)	
Smoking		
Yes	95.0 (26.0)	0.001*
No	76.0 (51.0)	
Former smoker	95.0 (22.0)	
Alcohol		
Yes	97.5 (15.0)	0.007*
No	79.0 (49.0)	
Former user	94.0 (22.0)	

Data are presented as median (interquartile range).
*Kruskal Wallis test; †Mann Whitney U test.

DISCUSSION

In this study, the frequency of frailty was found to be 26.2%. The frequency of frailty varies according to the society, the population studied, and the scale used. Kapucu et al. found the frequency of frailty to be 44.2% in a study of women with osteoporosis, and Sütlü found the frequency of moderate and severe frailty to be 29.5% in a study of 464 elderly people living in the community.[10,11] The relatively low frequency in this study may be due to the fact that bedridden patients were not included due to the investigation of knee functionality. The most important factors affecting frailty were found to be advanced age, female gender, non-smoking and/or alcohol use, and loss of knee function. The frequency of frailty increases with aging. Shortening of telomeres, increased free radical production, mitochondrial dysfunction, and some biochemical changes that occur with age in the human body have been investigated in relation to frailty. An increase in interleukin-6 and a decrease in high-density lipoprotein are strongly associated with frailty. When these changes affect homeostasis in a disruptive way due to acute and chronic inflammation or for genetic reasons, the frailty threshold is crossed and symptoms such as fatigue, loss of resistance, weight loss, falls, morbidity, dependency, and mortality will negatively affect the health of elderly patients.[12] As in this study, it has been shown in the literature that frailty increases with age.[13] Frailty was found to be four times more common in the female gender. In an article by Gordon et al. investigating the effect of gender on frailty, it was shown that although men had life-threatening diseases more frequently than women, women were likelier to experience non-life-threatening diseases.[14] Cerebrovascular diseases such as heart disease and ischemic stroke are common in men, while arthritis, osteoarthritis, rheumatic diseases, and urinary incontinence are more common in women. The knee joint is the most commonly affected by osteoarthritis. Again, rheumatic diseases are likely to cause fatigue and negatively affect activities such as walking and climbing stairs, especially in the elderly. In this study, the increase in fragility as knee functionality was lost and the lower Lysholm scores of the female gender may be related to this situation. In light of the information obtained from the FRAIL scale, the women interviewed had more fatigue, lower resistance, more difficulty getting around, and were likelier to have lost more than 5% of their weight in the past year. Ahrenfeldt et al. investigated the difference in frailty between gen-

ders in Europe and observed that women were anorexic, tired, weak, had difficulty walking, and had more comorbid diseases than men.[15] In this study, no significant difference was found between genders in terms of comorbid diseases. Smokers and alcohol users had higher Lysholm scale scores and were found to be less frail. In a meta-analysis, the risk of gonarthrosis was significantly reduced in smokers compared to non-smokers. Dose response analysis showed that the risk of gonarthrosis decreased linearly with increasing cigarette consumption.[16] There is an inverse and strong relationship between the Lysholm score and the FRAIL total score.

It is possible that patients with low knee functionality frequently give negative answers to the first 3 questions of the FRAIL scale. If the knees are not functional enough, fatigue and inability to climb 10 steps or walk several hundred meters without support are expected. When it is evaluated whether this situation causes frailty, it is considered to cause frailty according to the FRAIL scale. Similarly, a strong correlation was found between the Lysholm score and negative answers to the first three questions of the FRAIL scale. As the loss of knee functionality worsens, functional reserves such as fatigue, resistance, and ambulation worsen in elderly patients. Whatever the cause of frailty, the negative consequences associated with frailty are a problem for these patients, even in the absence of chronic disease or weight loss. Wanaratna et al. investigated frailty and associated factors in 780 community-dwelling elderly people with knee osteoarthritis and found that those with moderate or severe symptoms were statistically significantly more frail.[17] Many studies have proven that osteoarthritis is associated with frailty, even when different scales are used for frailty.[18-22] Some studies have associated the higher frequency of frailty in women with the higher frequency of osteoarthritis in women, as in this study.[23,24] In a prospective study by Bindawas et al., knee pain and frailty status of people with or without a diagnosis of osteoarthritis were investigated with their own statements, and it was concluded that those with knee pain, soreness, and stiffness were more frail.[21] Mobility impairment at advanced ages is associated with a higher risk of disability, lower quality of life, hospitalizations, admission to inpatient care, and death, as well as higher health costs.[25]

The limitations of this study are that the participants were not questioned about their sports habits in their youth, they generally lived in rural areas, and only the FRAIL scale was used to assess frailty. There is a need for more comprehensive studies in which the causes of movement limitations, fatigue, and diminished resistance are investigated, and knee functionality is evaluated with multiple fragility scales.

CONCLUSION

Identifying frailty in the elderly is the first step in preventing future negative outcomes. Frailty should not be seen as an inevitable process associated with aging, but rather as a preventable condition. Early detection and treatment of knee problems can reduce frailty and associated morbidity and mortality. This study provides results supporting the conclusion that loss of knee functionality increases frailty. Increasing mobility in the elderly at a younger age, encouraging regular sports habits, and providing early detection, diagnosis, and treatment of knee-related functional losses to prevent morbidity and mortality may be beneficial.

Disclosures

Peer-review: Externally peer-reviewed.

Conflict of Interest: The authors declare no conflicts of interest.

Funding: The authors declared that this study has received no financial support.

Ethics Committee Approval: Ethical approval for the study was granted by Gaziosmanpaşa University Clinical Research Ethics Committee (Approval date: August 25, 2022, Approval no: 83116987-523). Verbal and written informed consent was obtained from all participants, following the ethical guidelines. The study was carried out in an ethical framework by the World Medical Association Helsinki Declaration and Good Clinical Practices Guide of the Ministry of Health of Türkiye.

Authorship Contributions: Concept – E.Y., ,H.E.Y.; Design – E.Y., H.E.Y.; Supervision – E.Y., H.E.Y.; Resource – E.Y., H.E.Y.; Data collection and/or processing – E.Y., H.E.Y.; Analysis and/or interpretation – E.Y., H.E.Y.; Literature review – E.Y., H.E.Y.; Writer – E.Y.; Critical review – H.E.Y.

REFERENCES

Clegg A, Young J, Iliffe S, Rikkert MO, Rockwood K. Frailty in elderly people. Lancet 2013;381(9868):752–62.

2. Hoogendijk EO, Afilalo J, Ensrud KE, Kowal P, Onder G, Fried LP. Frailty: Implications for clinical practice and public health. Lancet 2019;394(10206):1365–75.
3. Collard RM, Boter H, Schoevers RA, Oude Voshaar RC. Prevalence of frailty in community-dwelling older persons: A systematic review. JAm Geriatr Soc 2012;60(8):1487–92.
4. Theou O, Brothers TD, Mitnitski A, Rockwood K. Operationalization of frailty using eight commonly used scales and comparison of their ability to predict all-cause mortality. J Am Geriatr Soc 2013;61(9):1537–51.
5. Elbi H, Özyurt BC. Prevalence of fragility and factors affecting fragility in ındividuals 65 years and older. Smyrna Med J 2021;1(1):9–17
6. İlhan B, Bakkaloğlu OK. Frailty and cancer screening rates in

older adults. J Istanbul Fac Med 2019;82(1):24–8.
7. University of Washington. Global Burden of Disease Study; 2019. Available at: https://vizhub.healthdata.org/gbd-results. Accessed: Sep 2, 2023.
8. Johnson VL, Hunter DJ. The epidemiology of osteoarthritis. Best Prac Res Clin Rheumatol 2014;28(1):5–15.
9. Celik D, Coşkunsu D, Kılıçoğlu Ö. Translation and cultural adaptation of the Turkish Lysholm knee scale: Ease of use, validity, and reliability. Clin Orthop Relat Res 2013;471(8):2602–10.
10. Kapucu S, Ünver G. Pain and frailty ın elderly females with osteoporosis. Turk J Geriatr 2017;20(4):306–14.
11. Sütlü S. frailty status and related factors of elderly people receiving aid from the social assistance foundation ın burdur province. Turk J Geriatr 2022;25(1):88–96.
12. Fulop T, Larbi A, Witkowski JM, McElhaney J, Loeb M, Mitnitski A, et al. Aging, frailty and age-related diseases. Biogerontology 2010;11(5):547–63.
13. O'Caoimh R, Sezgin D, O'Donovan MR, Molloy DW, Clegg A, Rockwood K, et al. Prevalence of frailty in 62 countries across the world: A systematic review and meta-analysis of population-level studies. Age Ageing 2021;50(1):96–104.
14. Gordon EH, Hubbard RE. Do sex differences in chronic disease underpin the sex-frailty paradox? Mech Ageing Dev 2019;179:44–50.
15. Ahrenfeldt LJ, Möller S, Thinggaard M, Christensen K, Lindahl-Jacobsen R. Sex differences in comorbidity and frailty in europe. Int J Pub Health 2019;64(7):1025–36.
16. Kong L, Wang L, Meng F, Cao J, Shen Y. Association between smoking and risk of knee osteoarthritis: A systematic review and meta-analysis. Osteoarthritis Cartilage 2017;25(6):809–16.
17. Wanaratna K, Muangpaisan W, Kuptniratsaikul V, Chalermsri C, Nuttamonwarakul A. Prevalence and factors associated with frailty and cognitive frailty among community-dwelling elderly with knee osteoarthritis. J Community Health 2019;44(3):587–95.
18. Wise BL, Parimi N, Zhang Y, Cawthon PM, Barrett-Connor E, Ensrud KE, et al. Frailty and hip osteoarthritis in men in the MrOS cohort. J Gerontol Series A Biomed Sci Med Sci 2014;69(5):602–8.
19. O'Brien MS, McDougall JJ. Age and frailty as risk factors for the development of osteoarthritis. Mech Ageing Development 2019;180:21–8.
20. Misra D, Felson DT, Silliman RA, Nevitt M, Lewis CE, Torner J, et al. Knee osteoarthritis and frailty: Findings from the multicenter osteoarthritis study and osteoarthritis ınitiative. J Gerontol A Biol Sci Med Sci 2015;70(3):339–44.
21. Bindawas SM, Vennu V, Stubbs B. Longitudinal relationship between knee pain status and incident frailty: Data from the osteoarthritis initiative. Pain Med 2018;19(11):2146–53.
22. Salaffi F, Di Carlo M, Carotti M, Farah S, Giovagnoni A. Frailty prevalence according to the Survey of Health, Ageing Retirement in Europe-Frailty Instrument (SHARE-FI) definition, and its variables associated, in patients with symptomatic knee osteoarthritis: Findings from a cross-sectional study. Aging Clin Exp Res 2021;33(6):1519–27.
23. Veronese N, Maggi S, Trevisan C, Noale M, De Rui M, Bolzetta F, et al. Pain increases the risk of developing frailty in older adults with osteoarthritis. Pain Med 2017;18(3):414–27.
24. Meessen JMTA, Leichtenberg CS, Tilbury C, Kaptein BL, Koster LA, Slagboom PE, et al. Frailty in end-stage hip or knee osteoarthritis: Validation of the Groningen Frailty Indicator (GFI) questionnaire. Rheumatol Int 2018;38(5):917–24.
25. Bernabei R, Landi F, Calvani R, Cesari M, Del Signore S, Anker SD, et al. Multicomponent intervention to prevent mobility disability in frail older adults: Randomised controlled trial (SPRINTT project). BMJ 2022;377:e068788.