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The investigation of frailty level and factors affecting frailty in older adults with osteoarthritis: a cross-sectional study on Turkish population

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ABSTRACT

Aims: This study aims to evaluate the fragility level, fall risks and factors affecting both conditions of individuals with OA aged 60 and over living in an underdeveloped province.

Methods: The research sample consists of 260 individuals over the age of 60 who were diagnosed with osteoarthritis. The frailty of the participants was measured. Their functional mobility and risk of falling were measured.

Results: The prevalence of frailty and pre-frailty was found to be 82%. It was revealed that frailty is not always affected by the severity of osteoarthritis and the progression of age. In addition, it was found that factors such as stage IV osteoarthritis and being frail or pre-frail increase the risk of falling. The stage of osteoartritis, education level, lifestyle, and risk of falling explained 24% of the variance in the frailty variable. Having an unhealthy lifestyle increases frailty 20 times; lowincome level increases frailty eight times; and each increase in education level affects frailty at most four times negatively.

Conclusion: Psychological rehabilitation and social support may negatively affect the development of frailty in individuals aged 60 years and older. Frail older women with severe OA are more vulnerable to falls.

Keywords: Frailty, osteoarthritis, geriatrics, frailty scale, risk of falling

INTRODUCTION

Aging is a physiological process and is characterized by a decrease or slowdown in all vital functions.[1] As of 2020, 9.5% of Turkiye's population consists of people aged 65 and over.[2] Old age is a period in which social, economic, psychological and health problems are experienced. People who have difficulties in coping with these problems may be morefrail. Frailty is a state of increased susceptibility to cognitive and physical negative consequences.[3] In addition, conditions such as stress intolerance, slowness, weakness, low physical activity, burnout, and decrease in body mass index, which develop due to the decrease in physiological reserves with advancing age, are considered as the indicators of frailty.[4,5] These indicators mean that frailty is one of the factors that increase susceptibility to degenerative joint diseases in older adults.[4]

Osteoarthritis (OA), which was once thought of only as the wear and tear of an aging joint, is now associated with the presence of many risk factors such as gender, obesity, and a history of joint trauma.[6] A number of systemic factors are likely to cause joint damage in a frail person, and many studies have proved that frailty may trigger the development of OA in older adults.[3,7-12] Frailty, like OA, is commonly observed with increasing age and pro-inflammatory markers such as IL-6, TNF-α and CRP, which play a role in inflammatory aging, are also elevated in frail individuals. These inflammatory factors found in frail individuals may trigger the development of OA.[11] With the early identification of frailty in older adults, the quality of life of patients can be preserved, early social support can be ensured, and many problems that may develop due to frailty can be identified early.[13]

Determining the effect of frailty on health problems associated with old age will contribute to early identification of these problems and taking precautions. Reducing the health burden with measures to be taken against age-related diseases may provide economic benefits in the long term. In this study, OA patients aged 60 years and older living in Yozgat province, an underdeveloped city with a large population of older adults, were analyzed. Thus, while examining the frailty levels of patients with OA, their fall risks and the factors affecting both conditions, it was also possible to examine the assumption that low income level, which is frequently emphasized in the literature, negatively affects frailty. In addition to contributing

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to the literature, the results obtained will provide information about the health status of older adults with low socio-economic status living in underdeveloped provinces.

METHODS

The study was initiated upon receiving approval from the Yozgat Bozok University Ethics Committee (Date: 16.02.2022, Decision no: 30/10). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

The research sample consisted of 260 individuals over the age of 60 who were diagnosed with OA and who applied to the Orthopedics and Traumatology outpatient clinic of Yozgat Bozok University Training and Research Hospital between 20.03.2022 and 20.06.2022. After the research, Gpower 3.1.9.2 program was used for post-hoc power analysis. With the two-way hypothesis assumption, effect size d=0.50 was taken as type 1 error (α err prob)=0.05. Since the number of female participants in the study was 159 and the number of male participants was 101, the power was calculated as (1- β err prob)=0.97 and it was determined that the representativeness of the sample was high.

Inclusion Criteria

- Being 60 years or older
- Having a diagnosis of Stage I, II, III or IV OA according to the Kellgren-Lawrence classification
- Having the mental competence to understand and answer the questions posed

Exclusion Criteria

- Receiving cancer treatment
- Extremity amputations
- Having physical disabilities such as sequelae due to stroke and inability to speak
- Having an operation due to an orthopedic problem in the last 6 months
- Having advanced dementia
- Having an organic psychoaffective disorder and/or a neurological degenerative disease

Data Collection Tools and Procedure

The OA stage of the participants was evaluated by an orthopedic and traumatology specialist based on the Kellgren-Lawrence Gonarthrosis stage classification and symptomatic findings. Tilburg Frailty Indicator (TFI) was assessed using the Frailty Scale (FS) and functional mobility was assessed using the Get Up and Go Test (GGT). A questionnaire form was created from these scales to conduct interviews with individuals aged 60 and over. The questionnaire form consists of four parts, in which the socio-demographic characteristics of the participants and the results of the TFI, FS and GGT are recorded.[14-19] In the socio-demographic characteristics section, the economic status of older adults was examined in detail. For this purpose, income and expenditure amounts were asked, and those whose income was more than expenditure and those whose income was less than expenditure were determined according to their statements. Before the administration of the questionnaire form, the participants were informed about the purpose of the research and their verbal and written consent was obtained.

The researcher, who was responsible for the administration of the questionnaire form, met with the older adults who were directed by an orthopedics and traumatology specialist face-to-face, from the beginning to the end of the polyclinic examination hours (between 9:00 and 17:00) on weekdays and measured their walking times. Before the administration of the questionnaire form, the participants were informed about the purpose of the research and their verbal and written consent was obtained. The same person administered the questionnaire form to all participants in the same environment and made the measurements.

Kellgren-Lawrence Classification

Kellgren-Lawrence classification was used to reveal the radiographic severity of gonarthrosis. Staging was performed according to the classification criteria given in Figure by a single orthopedics and traumatology specialist.

Stage I: Doubtful GA => Minute osteophyte, doubtful significance
Stage II: Mild GA => Definite osteophyte, normal joint space
Stage III: Moderate GA => Moderate joint space reduction
Stage IV: Severe GA => Joint space greatly reduced, subchondral sclerosis

Figure. Kellgren-Lawrence classification

Tilburg Frailty Indicator

TFI is a scale that forms a link between frailty and the rate of susceptibility resulting from physical, psychological and/or social losses defined in the integral conceptualization model of frailty. The Turkish adaptation study of the scale was conducted by Arslan et al.[14] The Cronbach's alpha in the Turkish adaptation study was 0.76. The Cronbach's alpha value obtained from this study is 0.69. The scale consists of two parts. The first part contains 10 items on the determinants of frailty. The second part is divided into three domains (physical, psychological, and social components), which are evaluated with 15 items. 11 items in the TFI have a double response category as 'yes' and 'no'. Four items have triple response categories as 'yes', 'sometimes' and 'no'. The score that can be obtained from the scale varies between 0-15, and a score of ≥5 indicate frailty.[14] An individual with high scores is considered to have a high level of frailty.

Frailty Scale

FS consists of five items on patient's fatigue status, vigor, mobility, weight loss and other diseases. Based on their responses, patients receive 0 or 1 point from each item in the FS. Those with a total score of 0 are considered to be vigorous (non-frail), while a score of 1-2 indicates pre-frailty and a score of >2 indicates frailty.[15] The Turkish validity and reliability study of the scale was performed by Hymabaccus Muradi and

Yavuz[16] in 2017. The internal consistency of the Turkish scale was found to be = 0.79. The Cronbach's alpha value obtained from this study is 0.63.

Get Up and Go Test

The get up and go test (GGT) was developed by Podsiadlo et al.[18] in 1991.[17] During the administration of the GGT, individuals may wear comfortable shoes and use the walking aid that they always use, as in their daily lives. The person sits on a chair, he/she has to get up from the chair he/she is sitting on with the command given and walk to the line drawn 3 meters ahead, turn from there and sit down again. When the command is given, the time is started and when the person returns from the walk and sits down, the time is stopped and noted down. According to the GGT, the test speed of individuals with a high risk of falling is ≥12 seconds.[19]

Statistical Analysis

Data analysis was performed using the statistical package for the social sciences (SPSS) version 20.0. For statistical analysis, firstly, it was checked whether the data showed normal distribution. Parametric tests were performed for all the research variables showing normal distribution. Descriptive statistics (mean, frequency percentage and standard deviation) were used in the analysis of the data. The t-test was performed to compare paired groups that conformed to parametric test variation, and the ANOVA test was used to compare more than two groups. Logistic regression analysis was performed to determine the factors affecting the high fall risks of individuals with OA and the factors affecting their frailty at the TFI level. The effect of the factors that increase the frailty of the participants according to the FS was evaluated with multiple linear regression analysis. The significance level was set at $p<0.05$.

RESULTS

Participants' mean TFI and FS scores indicate that they are frail and their recorded walking times indicate that they are at high risk of falling. An important finding was that individuals aged 72 years and older had a lower mean TFI score than those aged 60-65 years. 61.2% of the participants were female and their TFI and FS frailty scores and walking times were statistically significantly higher than those of male participants. Another statistically significant finding was that widows and singles had longer walking times than married participants 59.2% of the participants were primary school graduates and it was found that the level of frailty decreased as the level of education increased. It was also found that illiterate participants had longer walking times. 90.4% of the participants had an income less than their expenditure and their mean TFI and FS scores were statistically significantly higher than those with an income greater than their expenditure. Participants with healthy lifestyles comprised 51.9% of the population (all $p<0.05$) (Table 1).

The mean TFI (7.18±2.98) and FS (2.26±1.33) scores of participants whose income is less than their expenses indicate that they are more vulnerable than those whose income is more than their expenses. In addition, their walking time also shows that their risk of falling is high. It is statistically significant that female participants with less income have higher TFI and FS scores and longer walking time than male participants. It is significant that 74% of the participants with less income are married and that the walking time of married participants is shorter than that of widows and singles. It was found statistically significant that the TFI scores of illiterates were higher than the other groups, the FS scores of those who graduated from at least secondary school were lower than the other groups, and the walking time of those who graduated from at least secondary school was shorter than the other groups. The TFI and FS scores of participants with unhealthy lifestyles whose income was less than their expenses were found to be higher than the other groups. According to FS, 53.2% of participants with income less than expenditure were frail, 30.6% were pre-frail and 16.2% were vigorous. According to TFI, 82.1% of participants were frail and had high FS scores. According to the GGT, 39.6% of the participants had a high fall risk and their TFI and FS scores were higher than the other group. Participants with Stage I OA whose income was less than their expenses had lower TFI and FS scores and shorter walking times than the other groups (all $p<0.05$) (Table 2).

It was found that factors such as disease stage II, disease stage III, or disease stage IV, being female, being 72 years old and over, being widowed or single, having an unhealthy lifestyle, being frail according to the TFI, and being frail or pre-frail according to the FS increase the risk of falling in individuals aged 60 and over with OA (Table 3).

It was also found that factors such as disease stage II, disease stage III, or disease stage IV, being female, being 72 years old and over, being illiterate, being a primary school graduate, having a lowincome level, having neither a healthy nor an unhealthy lifestyle, having an unhealthy lifestyle, and having a high risk of falling increase frailty in OA patients aged 60 and over according to the TFI (Table 4).

Multivariate linear regression analysis revealed a significant regression model. It was found that the variables of OA stage, education level, lifestyle and fall risk explained $F(8.251)=11.214$, $p<0.001$, and 24% of the variance in the frailty variable (R^2adjusted=0.24) (Table 5).

DISCUSSION

Our study investigated frailty level and fall risks of individuals with OA and the factors affecting both conditions.

The Relationship between OA and Frailty

Studies proving the relationship between OA and frailty support the results of our study.[3,7-10,20] However, contrary to many studies, in our study, the prevalence of frailty among older adults was found to be 77.7% according to the TFI, and the prevalence of frailty and pre-frailty was found to be 82% according to the FS. Misra et al.[3] investigated frailty in older adults with gonarthrosis and in their study, the prevalence of frailty was found to be 4.39%. Miguel et al.[21] examined frailty in older adults with OA, and they found the frequency of frailty as 22.4%. In a study evaluating frailty among older adults with OA in six European countries, the overall prevalence of frailty

Table 1. Distribution of the effect of some characteristics of individuals aged 60 and over with OA on frailty and walking time (n=260)

Variables		n (%)	TFI 6.93±3.09 X±SD	FS 2.18±1.35 X±SD	GGT 13.37±9.37 X±SD
Age 66.37±6.68	60-65	150 (57.7)	7.34±3.20[a]	2.35±1.34[a]	13.18±10.89
	66-71	55 (21.2)	6.45±2.87	1.84±1.33[b]	12.18±5.15
	72+	55 (21.2)	6.29±2.84[b]	2.18±1.32	15.09±7.92
Test			**F=3.20, p=0.04**	**F=3.21, p=0.04**	**F=1.40, p=0.24**
Gender	Male	101 (38.8)	5.76±2.89	1.79±1.40	10.95±5.60
	Female	159 (61.2)	7.67±2.98	2.42±1.25	14.91±10.85
Test			**t=-5.08, p=0.000**	**t=-3.66, p=0.000**	**t=-3.86, p=0.000**
Marital Status	Married	197 (75.8)	6.77±3.06	2.10±1.36	12.34±7.50
	Widowed/single	63 (24.2)	7.44±3.13	2.41±1.27	16.58±13.22
Test			**t=-1.52, p=0.13**	**t=-1.59, p=0.11**	**t=-2.42, p=0.01**
Education level	Illiterate	67 (25.8)	8.24±3.26[a]	2.66±1.18[a]	16.04±12.71[a]
	Primary school	154 (59.2)	6.76±2.74[b]	2.19±1.28[b]	13.22±8.34
	Minimum secondary school	39 (15)	5.36±3.24[c]	1.28±1.43[c]	9.38±2.83[b]
Test			**F=12.26, p=0.000**	**F=14.11, p=0.000**	**F=6.54, p=0.002**
Income level	Income less than expenses	235 (90.4)	7.18±2.98	2.26±1.33	13.70±9.70
	Income more than expenses	25 (9.6)	4.60±3.18	1.40±1.25	10.24±4.16
Test			**t=4.08, p=0.000**	**t=3.07, p=0.002**	**t=1.76, p=0.07**
Lifestyle	Healthy	135 (51.9)	5.64±2.76[a]	1.76±1.34[a]	12.16±6.69
	Healthy/unhealthy	86 (33.1)	7.94±2.84[b]	2.43±1.24[b]	14.00±10.94
	Unhealthy	39 (15)	9.18±2.55[b]	3.05±1.02[c]	16.17±12.56
Test			**F=33.47, p=0.000**	**F=18.17, p=0.000**	**F=3.11, p=0.05**
FS	Vigorous	47 (18.1)	4.15±2.33[a]	0.00±0.00[a]	10.04±3.16[a]
	Pre-frail	81 (31.2)	6.35±2.83[b]	1.60±0.49[b]	12.81±9.82
	Frail	132 (50.8)	828±2.69[c]	3.30±0.52[c]	14.90±10.22[b]
Test			**F=44.10, p=0.000**	**F=969.21, p=0.000**	**F=5.01, p=0.007**
TFI	Vigorous	58 (22.3)	2.83±1.15	1.05±1.16	11.01±4.05
	Frail	202 (77.7)	8.11±2.38	2.50±1.22	14.04±10.31
Test			**t=-23.35, p=0.000**	**t=-8.03, p=0.000**	**t=-3.36, p=0.001**
Risk of falling	High risk	99 (38.1)	7.87±2.87	2.71±1.14	19.65±12.73
	No risk	161 (61.9)	6.35±3.08	1.85±1.36	9.50±1.82
Test			**t=-3.94, p=0.000**	**t=-5.43, p=0.000**	**t=-7.87, p=0.000**
OA stage	Stage I	63 (24.2)	5.58±3.40[a]	1.24±1.35[a]	10.22±3.65[a]
	Stage II	150 (57.7)	7.34±3.20[a]	2.35±1.34[a]	13.18±10.89
	Stage III	55 (21.2)	6.45±2.87	1.84±1.33[b]	12.18±5.15
	Stage IV	55 (21.2)	6.29±2.84[b]	2.18±1.32	15.09±7.92
Test			**F=5.12, p=0.002**	**F=15.69, p=0.000**	**F=8.37, p=0.000**

TFI: Tilburg frailty indicator, FS: Frail scale, GGT: Get up and go test, SD: Standart deviation, OA: Osteoarthritis, *This group is different from the others

and pre-frailty was found to be 10.2% and 51.0%, respectively.[7] A study conducted in four rural regions of Thailand that are assumed to represent the country reported the prevalence of frailty as 12.9%.[22] In a study on the locomotive syndrome and frailty in middle-aged and older people living in the community, the prevalence of frailty was found to be 10.8%.[23] There is not yet a gold standard scale to assess frailty. Therefore, the inconsistency between the findings of studies may be attributed to the use of different scales to investigate frailty. Contrary to other studies, we used both the TFI and the FS and revealed that frailty is quite common among older adults with OA aged 60 and over. The study was conducted in a province with a low socio-economic level, which may have also contributed to the high rates of frailty reported in the study. In our study focusing on the low-income group, both scales showed that frailty was even more common. Bandeen et al.[24] also found in their research that the prevalence of frailty is affected by income distribution differences.

Table 2. Distribution of frailty scores and walking time of individuals with OA aged 60 and over with low income (n=235)

Variables		n (%)	TFI X±SD	FS X±SD	GGT X±SD
Age	60-65	139 (59.1)	7.60±3.07[a]	2.42±1.31	13.48±11.23
	66-71	47 (20)	6.68±2.60	1.98±1.37	12.72±5.29
	72+	49 (20.9)	6.45±2.88[b]	2.06±1.33	15.28±8.11
Test			**F=3.62, p=0.02**	**F=2.67, p=0.07**	**F=0.92, p=0.39**
Gender	Male	85 (36.2)	6.15±2.75	1.95±1.42	11.35±5.84
	Female	150 (63.8)	7.76±2.95	2.43±1.25	15.04±11.12
Test			**t=-4.10, p=0.000**	**t=-2.68, p=0.008**	**t=-2.83, p=0.005**
Marital status	Married	174 (74)	7.07±2.92	2.21±1.35	12.71±7.81
	Widowed/single	61 (26)	7.49±3.15	2.39±1.29	16.52±13.43
Test			**t=-0.95, p=0.34**	**t=-0.91, p=0.36**	**t=-2.09, p=0.04**
Education level	Illiterate	63 (26.8)	8.21±3.27[a]	2.65±1.22[a]	16.19±13.04[a]
	Primary school	143 (60.9)	6.93±2.67[b]	2.24±1.29[a]	13.46±8.57[a]
	Secondary school/high school	29 (12.3)	6.17±3.24[b]	1.52±1.47[b]	9.51±2.30[b]
Test			**F=6.15, p=0.002**	**F=7.61, p=0.001**	**F=4.97, p=0.008**
Lifestyle	Healthy	113 (58.7)	5.96±2.66[a]	1.87±1.34[a]	12.60±7.05
	Healthy/unhealthy	85 (36.2)	7.95±2.85[a]	2.44±1.05[b]	14.04±11.00
	Unhealthy	37 (15.7)	9.14±2.57[b]	3.05±1.33[c]	16.29±12.82
Test			**F=24.42, p=0.000**	**F=13.45, p=0.000**	**F=2.12, p=0.12**
FS	Vigorous	38 (16.2)	4.55±2.40[a]	0.00±0.00[a]	10.42±3.26[a]
	Pre-frail	72 (30.6)	6.42±2.77[b]	1.61±0.49[b]	13.11±10.28
	Frail	125 (53.2)	8.42±2.57[c]	3.32±0.53[c]	15.04±10.42[b]
Test			**F=36.28, p=0.000**	**F=809.06, p=0.000**	**F=3.58, p=0.02**
TFI	Vigorous	42 (17.9)	2.93±1.19	1.07±1.11	11.80±4.15
	Frail	193 (82.1)	8.10±2.38	2.52±1.23	14.11±10.49
Test			**t=-20.50, p=0.000**	**t=-6.98, p=0.000**	**t=-1.40, p=0.16**
Risk of falling	High risk	93 (39.6)	7.95±2.88	2.74±1.14	19.86±13.09
	No risk	142 (60.4)	6.68±2.94	1.94±1.36	9.67±1.77
Test			**t=-3.26, p=0.001**	**t=-4.85, p=0.000**	**t=-7.45, p=0.000**
GA stage	Stage I	52 (22.1)	6.19±3.37[a]	1.37±1.38[a]	10.55±3.69[a]
	Stage II	49 (20.9)	6.92±3.12	2.47±1.17[b]	12.89±5.67
	Stage III	78 (33.2)	786±2.66[b]	2.53±1.30[b]	12.97±5.87[b]
	Stage IV	56 (23.8)	7.38±2.67	2.54±1.11[b]	18.35±16.70[b]
Test			**F=3.57, p=0.01**	**F=11.33, p=0.000**	**F=6.84, p=0000**

TFI: Tilburg frailty indicator, FS: Frail scale, GGT: Get up and go test, SD: Standart deviationi, GA: Gonarthrosis* This group is different from the others

The Relationship between Education Level and Socio-economic Status and Vulnerability

In addition, our study revealed that each increase in education level affects frailty at least three times and at most four times negatively, and lowincome level affects frailty eight times positively. This may be related to the lifestyles and health perceptions of individuals with low socioeconomic status and their access to health services. Our findings are consistent with the findings of Myers et al.,[25] who found that low-income patients have a more than twice the risk of being frail than high-income patients. Wanaratna et al. [22] reported in their study that low level of education and income, which they interpret as low socioeconomic indicators, affect frailty. Castell et al.[7] also found that frailty is more common in people with low socioeconomic status. The fact that individuals with a low education level work in jobs that require heavy physical effort reduces both their susceptibility to movement system diseases and the amount of income to be earned. This causes malnutrition and prevents nutrition with foods that support health. In addition, low household income is another factor that may complicate access to health services. Therefore, while such conditions limit healthy living conditions, they also increase the number of individuals with low health awareness. Research findings showing that having an unhealthy lifestyle increases frailty 20 times support this assumption. Bandeen et al.[24] reported that frailty is doubled in older adults with adverse health conditions.

Table 3. Logistic regression analysis of factors affecting the high fall risk of individuals aged 60 and over with OA

						95% CI for EXP (B)	
Variables	**ß**	**SE**	**Wald**	**p**	**OR**	**Lower**	**Upper**
OA Stage II (Stage I)	1.057	0.428	6.117	0.013	2.879	1.245	6.656
OA Stage III (Stage I)	0.825	0.395	4.367	0.037	2.282	1.053	4.949
OA Stage IV (Stage I)	1.839	0.412	19.897	0.000	6.290	2.804	14.112
Female (Male)	1.052	0.283	13.864	0.000	2.865	1.646	4.985
66-71 age (60-65 age)	0.134	0.330	0.164	0.685	1.143	0.599	2.180
72+ age (60-65 age)	0.802	0.321	6.253	0.012	2.231	1.189	4.184
Widowed or single (Married)	0.695	0.293	5.602	0.018	2.003	1.127	3.560
Primary school graduate (Illiterate)	-0.191	0.292	0.422	0.516	0.826	0.464	1.471
Secondary school or high school graduate (Illiterate)	-2.020	0.582	12.045	0.001	0.133	0.042	0.415
Medium or high income level (Low income level)	-0.729	0.487	2.244	0.134	0.482	0.186	1.252
Neither healthy nor unhealthy lifestyle (Healthy lifestyle)	0.253	0.288	0.772	0.380	1.288	0.732	2.264
Unhealthy (Healthy lifestyle)	0.984	0.371	7.024	0.008	2.676	1.292	5.543
TFI Frail (1)	0.713	0.332	4.613	0.032	2.041	1.064	3.913
FS Pre-frail (Vigorous)	1.173	0.498	5.551	0.018	3.230	1.218	8.568
FS Frail (Vigorous)	-1.922	0.470	17.215	0.000	7.044	2.801	17.713

ß: Coefficient; SE: Standard error; p: Significance level; OR: Odds ratio; CI: Confidence interval; OA: Osteoarthritis, FS: Frail scale

Table 4. Logistic regression analysis of the factors affecting the frailty levels of individuals aged 60 and over with OA according to TFI

						95% CI for EXP (B)	
Variables	**ß**	**SE**	**Wald**	**p**	**OR**	**Lower**	**Upper**
OA Stage II (Stage I)	0.963	0.425	5.128	0.024	2.619	1.138	6.027
OA Stage III (Stage I)	1.754	0.436	16.183	0.000	5.778	2.458	13.580
OA Stage IV (Stage I)	1.074	0.411	6.836	0.009	2.928	1.309	6.551
Female (Male)	0.864	0.303	8.136	0.004	2.372	1.310	4.295
66-71 age (60-65 age)	-0.354	0.372	0.904	0.342	0.702	0.338	1.456
72+ age (60-65 age)	-0.448	0.367	1.491	0.222	0.639	0.312	1.311
Widowed or single (Married)	0.258	0.362	0.508	0.476	1.295	0.636	2.634
Illiterate (Secondary school or high school)	1.483	0.471	9.910	0.002	4.405	1.750	11.087
Primary school graduate (Secondary school or high school graduate)	1.120	0.380	8.677	0.003	3.066	1.455	6.461
Low income level (Medium or high income level)	2.100	0.450	21.775	0.000	8.169	3.381	19.739
Neither healthy nor unhealthy lifestyle (Healthy lifestyle)	1.401	0.382	13.462	0.000	4.059	1.920	8.579
Unhealthy (Healthy lifestyle)	3.010	1.029	8.558	0.003	20.295	2.701	152.522
High risk of falling (1)	0.713	0.332	4.613	0.032	2.041	1.064	3.913

OA: Osteoarthritis, TFI: Tilburg frailty indicator, ß: Coefficient, SE: Standard error, p: Significance level, OR: Odds ratio, CI: Confidence interval, OA: Osteoarthritis

Association of OA Severity with Frailty

Another finding that affects frailty is the severity of the disease. Having stage III OA increases susceptibility to frailty almost 6 times. This finding is rather ironic when compared to the fact that being a stage IV OA patient increases frailty 2 times. Stage III, characterized by moderate joint space reduction, may indicate progression of the disease and may increase cognitive frailty and trigger the sense of helplessness in older adults. Contrary to some other studies, it can be said that susceptibility to frailty does not increase as the severity of OA increases.[10] This finding may be attributed to the perceived helplessness that develops as a result of the progression of the disease in older adults. Fight against the disease is at the forefront at stage III. However, older adults who have experienced severe reduction in joint space and sclerosis in the subchondral bones at stage IV and who have been struggling with the disease for a long time, may have accepted that the disease is inevitable and have developed some defense mechanisms for living with the disease.

Table 5. Evaluation of the independent risk factors that increase the frailty of individuals with OA aged 60 and over, according to FS with multiple linear regression analysis

					95% GA	
Variables	**ß**	**SD**	**t**	**p**	**Lower**	**Upper**
Stage	0.103	0.041	2.543	0.012	0.023	0.183
Gender	-0.009	0.101	-0.085	0.933	-0.208	0.191
Age	-0.084	0.055	-1.530	0.127	-0.192	0.024
Marital status	0.017	0.105	0.164	0.870	-0.190	0.224
Education level	-0.103	0.33	-3.114	0.002	0.169	-0.038
Income level	-0.107	0.147	-0.727	0.468	-0.397	0.183
Lifestyle	0.252	0.059	4.240	0.000	0.135	0.369
Risk of falling	0.291	0.093	3.143	0.002	0.109	0.474

OA: Osteoarthritis, FS: Frail scale, ß: Regression coefficient, SD: Standard deviation, t: Degree of freedom, p: Significance level, CI: Confidence interval

Frailty in Relation to Age

The mean age of individuals with OA over the age of 60 is 66.37 years, and the majority are between 60-65. Contrary to many studies, a remarkable finding of our study is that the level of frailty decreases as age increases. In this sense, our findings can be described as encouraging. The frailty levels of older age groups who visit the outpatient clinic are lower, which means that frailty is not always related to old age. More comprehensive studies are needed to investigate the health status, socio-demographic characteristics, health perception, health attitude and daily life activity level of older individuals who are not frail. Our study further revealed that the risk of falling is doubled in those aged 72 and over. This may be related to the increase in the tendency to walk carefully and slowly due to the fear of falling with increasing age.

Factors Influencing the High Risk of Falls in Older Adults with OA

Falls and fall-related fractures are one of the leading causes of the need for long-term care of the elderly. Abellan van Kan et al.[26] defined slow walking speed as a strong predictor of frailty-related medical complications. The GGT test showed that 38.1% of the participants had a high risk of falling (walking time >12sec). When the factors affecting the high fall risk in older adults with OA were examined, it was found that frailty increased the risk of falling seven times and having stage IV OA increased the risk of falling six times. Consistent with other studies,[7-9,12] our study revealed that women were more prone to frailty than men, and being a female is a factor that doubles the risk of falling. Being widowed or single also doubles the risk of falling. According to the FS, frailty is the most important factor that increases the risk of falling in older adults aged 60 and over, and pre-frailty increases the risk of falling three times. According to the TFI, frailty doubled the risk of falling. The inconsistency between the scales may be attributed to the fact that the TFI evaluates physical, psychological and social frailty, while FS focuses on fatigue and functional mobility to determine the risk of falling, which makes it a more sensitive scale. However, this judgment also needs more evidence.

Limitations

First limitations, the data were collected from a single center within a certain period of time. Second, older adults living in the community were included in the research, while older adults living in nursing homes could not be reached. Lastly, other components of a comprehensive geriatric assessment (functionality, cognitive status, depression, nutritional status) were not evaluated separately and a single scale (TFI) was used for this.

CONCLUSION

The findings obtained using standard measurement tools support the importance of frailty in the etiology of OA, which is a common problem in individuals aged 60 and over. Having an unhealthy lifestyle increases frailty 20 times; lowincome level increases frailty eight times; and each increase in education level affects frailty at most four times negatively, which all point to the close relationship between frailty and socioeconomic level. Supporting socioeconomic status and promoting a healthy lifestyle can help prevent OA and frailty in older adults. Contrary to other studies, we found that frailty is not always related with the severity of OA and advancing age, which suggests that psychological rehabilitation and social support may affect the development of frailty negatively in individuals aged 60 and over. Our findings highlight that being a female, the severity of the disease, advanced age, and most importantly, being frail make older adults with OA more vulnerable in terms of falling.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was carried out with the permission of from the Yozgat Bozok University Ethics Committee (Date: 16.02.2022, Decision No: 30/10).

Informed Consent

All patients signed and free and informed consent form.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

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Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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