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Frailty Among Elderly Adults in a Rural Area of Turkey

Authors' Contribution:
Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
Literature Search F
Funds Collection G

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Background: The elderly population is growing in Turkey, as it is worldwide. The average age of residents in rural areas of Turkey is relatively high and is gradually increasing. The purpose of this study is to summarize the fitness and frailty of elderly adults living in a rural area of Turkey characterized by a relatively low level of socioeconomic development.

Material/Methods: This study was designed as a prospective, cross-sectional study, and was conducted in a rural area of Kars Province. A total of 168 elderly adults (≥65 years old) from 12 central villages were included in the study. The Fried Frailty Criteria was used to assess the frailty of the participants. In addition to frailty, the physical, social, and mental status of elderly adults was examined.

Results: The prevalence of frailty in this rural area of Turkey was 7.1%.The study group ranged in age from 65 to 96 years (mean 72.70±7.73 years), and 53.6% were female. Among the elderly adult group, 84.3% had not completed elementary school, and 43.29% had a monthly income of ≤500 Turkish liras ($200). No significant relationship was identified between gender and frailty. There was a statistically significant relationship between frailty and older age, lower education level, lower economic level, co-morbidities, polypharmacy, diabetes, chronic obstructive pulmonary disease, gastric disease, arthritis, generalized pain, benign prostatic hyperplasia, urinary incontinence, auditory impairment, impaired oral care, caregiver burden, impaired cognitive function, depression, or a lack of social support (social isolation).

Conclusions: It is believed that this study will contribute considerably to understanding the health status and needs of elderly adults in Turkey and the health problems of this population as well as to planning the development of public health and geriatric services based on regional needs.

MeSH Keywords: **Frail Elderly • Geriatric Assessment • Health Status Indicators**

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Background

Eastern Anatolia, the region of Turkey encompassing Kars Province, ranks below the nationwide average for all socio-economic criteria [1]. In Kars Province, 56.95% of the population lives in rural areas; the average percentage of the population living in rural areas is 22.72% nationwide [2]. While the rural population aged 65 years or older was 1.7 million in 2000 (7.4% of the total rural population), this number increased to 1.9 million in 2010 (to 11.1% of the total rural population). Within the same period, the urban population of individuals aged 65 years or older increased from 2.1 million in 2000 (4.7% of the total urban population) to 3.4 million in 2010 (6% of the total urban population). The results of the Turkish Population and Health Research study conducted in 2008 indicated similar numbers and ratios (an elderly urban population ratio of 5.5% compared with an elderly rural population of 10.1%) [2]. This difference is due to the migration of the younger population to cities, while the elderly population remains in rural areas The migration of retired elderly individuals from urban areas to rural areas has also contributed to this difference (Between 1980 and 2013, the rate of net migration was –113.1 in Kars Province: in migration was 19.102; out-migration was 89.974; and net migration was –70.872) [2].

Kars Province is located in the Caucasus region, which has extreme weather and living conditions and a long winter. It is clear that there are real challenges for the elderly living in rural areas in accessing medical and social services, and it has been noted that there are inequalities in frailty and fitness between rural and urban elderly adults, even in developed countries [3,4]. While there is no consensus regarding the definition of frailty, it is commonly recognized as a geriatric syndrome that includes functional decline, falls and institutionalization [5]. Although frailty has been considered synonymous with disability and co-morbidity, co-morbidity is more accurately an etiological risk factor for disability, and disability is an outcome of frailty [6]. Many frailty indices are defined in the literature. A systematic review by Vries et al. demonstrated that Mitnitski et al. produced the only frailty index that covers all frailty factors [7]. However, in the current study, the Fried Frailty Criteria was used because it shows high validity and reliability levels, which has been demonstrated in several reports [6,8,9].

The aim of the current study was to identify the frailty level and to examine problems with the well-being of elderly persons in the central villages of Kars Province in Turkey, which is characterized as a rural area with a relatively low level of socioeconomic development. In this context, this study also attempted to determine the relationship between socio-demographic factors and the health status of elderly adults in the region.

Material and Methods

Study design

Setting

This cross-sectional study was conducted from April to September 2014 and used a door-to-door survey to examine 168 elderly subjects (aged 65 years and over) who lived in 12 different villages in Kars Province (Bulanık, Kozluca, Çakmak, Yalınkaya, Kocabahçe, Mezra, Karakale, Yaylacık, Çığırgan, Hapanlı, Karaçoban, and Subatan). All of these villages have similar socio-economic and cultural characteristics. Residents in these villages rely on agriculture and animal husbandry for their livelihoods. The Kafkas University Medical Faculty Ethics Committee approved the study (protocol number: 050-99/83), and all of the participants provided verbal informed consent.

Sample

The total number of people aged 65 years and older in the rural area of Kars Province was 3,115 (the universe of study) according to the 2013 census [2]. Using the Epi-info Statcalc package 2000, the required sample size was calculated to be 168 for a 95% cluster interval, 50% observation frequency, and 10% deviation (sample error) with 20% backup. The sample was recruited from 12 villages. The participants' addresses were obtained from their family physicians. The researcher planned to find elderly adults without sample selection. When participants could not be located, they were replaced with other elderly residents in the same villages to maintain the established number. The researcher performed face-to-face interviews at the participants' homes to obtain demographic characteristics, comprehensive assessment, and measurements. The interviews and measurements took more than 2 hours for each participant. Therefore, the survey (168 individuals) was completed over a 6-month period. The exclusion criteria were severe medical conditions, such as the terminal period of physiological diseases, stroke, cancer, Parkinson's disease, anti-depressant use, and significant cognitive impairment [6,9].

Dependent variable

In this non-random convenience sample, the main dependent variable was frailty. In addition, to assess overall health, a comprehensive physical assessment was performed, and the cognitive function, emotional status, and social health status of participants were evaluated [8].

Measurement of frailty

The Fried Frailty Criteria (FFC) was used to measure frailty [6]. All 5 criteria were employed (slow gait speed, muscle weakness,

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low physical activity, self-reported exhaustion and unintentional weight loss), although some measurements were slightly modified [5,8,9], as detailed below. Slow gait speed was measured through the 6-meter walking speed test (range, 0.1 to 1.96 m/s) and was adjusted for gender and height according to the standards of the Short Physical Performance Battery (less than 0.8 m/ces) [9]. Muscle weakness was measured with a Jamar Analogue Hand Dynamometer, and the average score for the dominant hand, adjusted for gender and BMI (kg/m^2), was recorded [10]. The Independence in Activities of Daily Living (ADL) index was used to evaluate low physical activity [11]. The instrumental activities of daily living were not evaluated. ADL testing included bathing, dressing, toileting, transferring, continence, and feeding. The score on this scale ranged from 6, which indicates high independence, to 0, which indicates very dependent. The ADL values were dichotomized as follows: 3 or less: dependent; 4 or more: independent [11]. Self-reported exhaustion was evaluated by asking: "Do you feel a lack of energy or fatigue or tiredness?" (yes or no) [9]. No depression scale was used for the assessment of exhaustion. Unintentional weight loss was measured based on a self-reported weight loss of 3 kg or more in the previous 3 months. The data were dichotomized yes or no [9]. Additionally, the Mini Nutritional Assessment-Short Form (MNA-SF) was used to evaluate the risk of malnutrition. The MNA-SF consists of 6 items (including body mass index) classified in 2 categories. A score ≥12 points is normal, whereas ≤11 indicates a risk of malnutrition [12]. Frailty was defined as matching 3 or more of the following criteria: slow gait speed, muscle weakness, low physical activity, self-reported exhaustion and unintentional weight loss. In the classification of frailty, a score of zero was not frail; a score of 1–2 was intermediate frailty (pre-frail); and a score of 3 or more was categorized as frail [6].

Independent variables

The independent variables were age, gender, education, economic status, marital status, and living arrangements (number of persons living with the respondent).The participants were divided by age for the analysis into groups of 79 or younger and 80 or older. Education was evaluated as the years of formal schooling completed (range 0 to 15). For the analysis, education levels were dichotomized as 0 to 3 years *vs.* 4 years or more. Living arrangements (range 0 to 16) were dichotomized as none (living alone) versus 1 or more. During the first years of the Republic of Turkey (founded in 1923), elementary education spanned a period of 3 years. Because the current study group consisted of elderly adults, education was dichotomized as 0 to 3 years and 4 years or more. Dichotomized by gender, the adult population illiteracy rate (15 years of age and older) has changed over the years: 18.70% of women and 30.81% of men in 1935; 53.61% of women and 70.96% of men in 1970; 86.50% of women and 4.42% of men in 2000; and 90.31% of women and 97.98% of men in 2011 [13].

Economic status was ascertained by asking the mean individual monthly income. Statistical evaluations of economic status were based on the subjects' average monthly income and were divided for the analysis into a set of 2 variables reflecting the poverty line (less than500 TRY≈$200) [9].

Comprehensive geriatric assessment

As the baseline of the survey, the comprehensive geriatric assessment (CGA) was applied, which was designed to determine older individuals' medical conditions, mental health, and social circumstances. The components of the CGA include the evaluation of general health status, functional status (assessed in the frailty index), cognitive function, affective disorders, social support, the physical environment, and caregiver burden [14].

Physical health

Physical health statuses and co-morbidity

A 9-item form was used to assess the physical health status of the subjects (chronic diseases, medication use, body mass index, past falls-accidents-operations, smoking, mouth and teeth care, visual and auditory sensory impairment, generalized pain, and incontinence).The physical health status and comorbidities of the elderly adults were evaluated by examining the available medical records for any information regarding chronic diseases (diabetes mellitus (DM), hypertension, heart disease (including only myocardial infarction and angina pectoris from medical record), renal disease, chronic obstructive pulmonary disease (COPD), gastric diseases (only from medical records, including dyspepsia, gastro-oesophageal reflux, gastritis and gastric ulcer), thyroid function disorders, arthritis, and benign prostatic hypertrophy. The data were dichotomized as yes or no. Co-morbidity consisted of at least 2 medical diseases in same period. In the evaluation of medication use, using a drug for more than 1 indication at the same time was accepted as polypharmacy [15].

Body Mass Index

Each patient's body mass index (BMI) was calculated by measuring his or her height and weight on the interview day. Weight was measured with the same scales and height with a stadiometer on a wall at home. The measurement results were categorized (according to the European Guidelines for Obesity) as (kg/m^2) <18.5: underweight, 18.5–24.9: normal weight, 25–29.9: overweight, ≥30: obese [16] and the data were dichotomized as ≤24 and ≥25.

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Falls, accidents and smoking

Self-reported past falls, accidents (resulting in hospitalization), and operations were scored as yes or no [6,9]. Smoking was assessed as former, never, or current; the duration and quantity of use were not evaluated. In the analysis, only current smokers were assessed as yes; all others were assessed as no.

Oral care

The "dental" method was employed for the assessment of oral care, consisting of 6 items (dry month, oral pain, oral lesion, eating difficulties, changes in eating behavior, and recent dental care) [14].The indication of 3 or more items was accepted as worse oral care [14].

Sensory impairment

Regular ophthalmological examinations, using eyeglasses, cataracts, glaucoma, and diabetic retinopathy were queried for visual assessment. Visual impairments were assessed by asking about trouble with vision (yes or no). For auditory assessment, the "whisper test "was used as a performance test (a researcher stood 20-40 cm behind the individual, who had 1 ear closed, and the subject was asked to repeat something said by the researcher) [14].

Generalized pain and urinary incontinence

The visual analogue scale (VAS) was employed to assess generalized pain [17].Using a ruler, the VAS score is determined by measuring the distance (mm) on the 10-cm line between the "no pain" anchor and the patient's mark, providing a range of scores from 0–100. The score was interpreted as no pain (0–4 mm), mild pain (5–44 mm), moderate pain (45–74 mm), or severe pain (75–100 mm), and the data were dichotomized as ≥45 mm and ≤44 mm [17]. To assess urinary continence, the patient was asked whether incontinence was a problem at least 5 times a day (yes or no) [14].

Physical condition of the house

During the interview, the researcher assessed the physical condition of the house by recording the number of rooms; the presence of electricity, running water, and home equipment; and the interior design of home. The data were dichotomized as good or not good.

Caregiver burden

Caregiver burden was based on self-reporting (yes or no) [14]. To minimize complicated medical problems for the analysis, individuals with no co-morbidities and no inappropriate medication use were considered to be physical healthy.

Cognitive-emotional health

Cognitive function was assessed using the Standardized Mini Mental Scale (SMMS) [18]. The SMMS consists of 12 questions. The maximum score is 30; 24–30 is accepted as normal, 18–23 as mild cognitive impairment, and ≤17 as severe (significant) cognitive impairment [18]; the data were dichotomized as ≥24 and ≤23. The emotional status of the participants was assessed only for depression using the Geriatric Depression Scale-Short Form (GDS-SF) [19]. Other relatively uncommon mental health disorders (e.g., schizophrenia, bipolar disorder, and other mental health disorders) were not included in this study. The GDS-SF consists of 15 items scored between 0 and 15 points to evaluate the presence and severity of depression. The lowest possible score for this scale is 0, and the highest possible score is 15. Individuals with a GDS-SF score ≥5 were considered to be depressed, whereas individuals with a score ≤4 were not considered to be depressed. This scale does not require the person administering it to undergo any particular training. Individuals with no cognitive and emotional problems were considered to be mentally healthy.

Social health

For the evaluation of social health, the questionnaire included questions assessing social integration, overall life satisfaction, trust issues, the perception of safety, solidarity and sharing of tasks between individuals, social participation, a sense of belonging, and socioeconomic security among individuals. Good perceived social support (social well-being) was dichotomized as yes or no. Individuals who were satisfied with their social life were considered to be socially healthy. The survey questions used to evaluate the comprehensive health status of the elderly adults were prepared using the Copenhagen Criteria (i.e., social-psychological-physical health measures) [20].

Statistical analysis

SPSS20.0 (IP number: 194.27.41.6) software was used for data analysis. Percentage distributions, frequencies, arithmetic means, and standard deviations (SD) were examined. According to the type of variable (continuous or categorical), the participants' characteristics were described by means and SD or frequencies and percentages, respectively. The chi-squared test was used to analyze categorical data. Pearson's chi-squared and Fisher's exact tests were employed to compare variables. The threshold for statistical significance was set at $p<0.05$.

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Table 1. Socio-demographic characteristics of the participants and their relationship with frailty.

Characteristic		n=168	%	Min	Max	Mean	SD	p (frailty)
Age	≤79	140	83.2	65	96	72.70	7.73	**0.032**
	≥80	28	16.8					
Gender	Female	90	53.6					**0.126**
	Male	78	78					
Civil status	With partner	60	35.7					**0.475**
	Without partner	108	64.3					
Level of education	0–3 years	141	84.3				**0.021**	
	≥4 years	27	15.7					
Living arrangement	Alone	4	2.4	0	16	6.71	2.19	0.325
	≥1	164	97.6					
Monthly income	≤500 TRY	73	43.2	100.0	3000.0	697.14	421.34	**0.046**
	≥501 TRY	95	56.8					
Physical condition of the house	Good	90	53.6					**0.039**
	Not good	78	46.4					
BMI	≤24	140	83.2					0.171
	≥25	28	16.8					

Data are presented as the mean ±1 SD.

Results

Socio-demographic results

The study group ranged in age from 65-96 years (mean 72.70±7.73 years), and 53.6% were women. The women ranged in age from 65–95y ears (mean71.36±6.75 years) and men from 65-96 (mean73.88±8.12 years). Sixteen percent of the participants were aged 80 years or older. Sixty-four percent of the participants had no partner (widows). The percentage of participants with an education level of less than 3 years was 84.3%. Two percent of the elderly adults in this study group lived alone. For the living arrangement variable, the mean number of persons living with the respondents was 6.7 (min: 0, max: 16). The percentage of the elderly subjects with a monthly income of less than 500 TRY was 43.2%. Fifty-three percent of the participants' houses were in good physical condition. Eighty-three percent of the participants were of a normal weight according to the BMI. The percentages and frequencies of the socio-demographic and disease characteristics are summarized in the first 5 columns of Table 1.

Prevalence and frequency of frailty components results

The prevalence of frailty in the rural area of Kars was 7.1%.The rate of intermediate frailty (pre-frailty) was 47.3%. The percentage of non-frail adults was 45.6%. The most frequently observed frailty criterion was a slow gait speed (83.2), where as muscle weakness was observed in 81.9% of participants, and low physical activity was found in 79.6%. The percentage of self-reported exhaustion was 72.3%, and that of unintentional weight loss was 2.4%. There were higher rates of "self-reported exhaustion" in women than in men. No women reported "unintentional weight loss" among the participants. The first 3 criteria for frailty were observed at similar rates between men and women (Table 2).

Results of comprehensive assessment

The rate of co-morbidity and polypharmacy was 19.0%. The most frequently observed chronic disease was hypertension (45.2%). The rate of heart disease was 17.3%; diabetes mellitus (type II), 13.1%; chronic obstructive pulmonary disease, 11.6%; gastric diseases, 16.3%; benign prostatic hypertrophy

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Table 2. Frequency of frailty components in participants.

	Total (n=168)	Men (n=78)	Women (n=90)
Frailty criteria	%	%	%
Slow gait speed	83.2	41.2	42.0
Muscle weakness	81.9	40.8	41.1
Low physical activity	79.6	38.9	40.7
Self-reported exhaustion	72.3	33.7	**38.6**
Unintentional weight loss	2.4	2.4	–

Table 3. Relationship between the comprehensive geriatric assessment and frailty.

Comprehensive assessment (n=168)			Frailty	
	n	%	χ^2	p
Hypertension	76	45.2	1.967	0.974
Heart disease	29	17.3	2.521	0.118
Diabetes mellitus	22	13.1	**13.675**	**<0.001**
COPD	19	11.6	**3.187**	**0.037**
GD	27	16.3	**4.394**	**0.020**
BPH	28	16.7	**3.329**	**0.035**
Arthritis	81	48.3	**15.156**	**<0.001**
Generalized pain	98	58.3	**5.973**	**0.003**
Overweight	28	16.7	0.768	1.015
Thyroid function disorder	7	4.2	0.462	1.634
Incontinence	86	51.2	**5.341**	**0.007**
Mouth and teeth care	96	57.1	**3.945**	**0.025**
Visual sensory impairment	13	8.3	1.046	0.134
Auditory sensory impairment	17	10.7	**3.262**	**0.036**
Polypharmacy	32	19.0	**15.766**	**<0.001**
Co-morbidity	32	19.0	**15.766**	**<0.001**
Past falls & accidents	4	2.4	**3.273**	**0.036**
Past operations	5	2.8	1.938	0.456
Smoking	20	11.9	0.938	1.072
SMMS	11	6.8	**3.758**	**0.028**
GDS	18	10.9	**4.116**	**0.021**
Caregiver burden	12	7.3	**8.647**	**0.001**
Social well-being	160	95.2	**14.325**	**<0.001**

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Table 4. Socio-demographic characteristics and health status of the participants based on ADL, SMMS, and GDS-SF scores.

Characteristic	ADL*		SMMS**		GDS***	
	<3–≥4		≤23–≥24		≤4–≥5	
	χ^2	p	χ^2	p	χ^2	p
Age	**3.163**	**0.043**	**16.437**	**<0.001**	1.823	0.121
Gender	1.745	0.182	1.689	0.245	**8.129**	**<0.001**
Level of education	0.982	0.843	**4.234**	**0.019**	1.679	0.273
Economic level	2.127	0.091	1.453	0.327	**5.463**	**0.007**
Living arrangements	1.654	0.187	2.341	0.073	2.293	0.084
Co-morbidity	**4.154**	**0.021**	**6.174**	**0.003**	**4.527**	**0.018**
Overweight	**6.498**	**0.003**	1.413	0.276	**3.684**	**0.029**
Caregiver burden	**17.328**	**<0.001**	**11.173**	**<0.001**	**6.734**	**0.002**
Social well-being	**14.356**	**<0.001**	**8.193**	**<0.001**	**11.256**	**<0.001**

* Activities of Daily Living; ** Standardized Mini Mental Scale; *** Geriatric Depression Scale.

(BPH),16.7%; arthritis, 48.3%; generalized pain, 58.3%; an overweight status, 16.8%; thyroid function disorder, 4.2%; and urinary incontinence, 51.2%. No elderly adults were at risk of malnutrition according to the mini nutritional assessment-short form. None of the participants exhibited renal disease. Dental-oral problems were found in 57.1% of participants. The audio impairment rate was 10.7%; the visual impairment rate was 8.3%; and the smoking rate was 11.9%. The rate of accidents and falls was 2.4%, and most were related to agricultural work. The rate of past general operations (surgery) was 2.8%. Eighty-one percent of the participants were physically healthy, as they showed no co-morbidities or polypharmacy. The percentage of caregiver burden was 7.3%. The impaired cognitive status rate was 6.8% in this study group according to the standardized mini mental scale. The rate of depression was 10.9%, as measured using the GDS-SF. The rate of perceived social support and social well-being was 95.2% (Table 3). Ninety-three percent of the elderly group was functionally active according to the ADL measurement. A significant relationship was found between age and frailty. The frequency of frailty was 3 times greater among the subjects aged 80 years or older.

Statistical relationship results

No significant relationship was identified between gender, marital status, living arrangements, and frailty. A significant difference was found between a low educational level, low economic level, and frailty (people who were less educated and presented a low economic level were more frail). The participants' socio-demographic characteristics and their relationship with frailty are summarized in the last column of Table 1. A significant relationship was found between co-morbidities, polypharmacy, and frailty. There was no significant relationship between frailty and exhibiting only hypertension, heart disease, an overweight status, or a thyroid function disorder. A statistically significant difference was found between frailty and diabetes mellitus, chronic obstructive pulmonary disease, gastric diseases, arthritis, generalized pain, urinary incontinence, benign prostate hyperplasia, auditory impairment, and worse oral care.

Relationship between frailty results

No significant relationship was identified between frailty and smoking or visual impairment. A significant relationship was found between frailty and past falls/accidents. No significant relationship was identified between past operations and frailty. A significant relationship was found between frailty and the physical condition of the participants' house: it was observed that living in a house in good physical condition was related to being less frail. Significant relationships were also detected between caregiver burden and frailty; cognitive impairment and frailty; and depression and frailty in elderly adults. A small number of participants (n=4) had no social support, and individuals who were socially isolated were frailer in these cases (Table 3). There was a significant relationship with ADLs and older age, co-morbidities, an overweight status, caregiver burden, and social isolation.

Relationship between mental health and social health results

A significant relationship was found between cognitive impairment and older age, lower educational level, co-morbidities, caregiver burden, and social isolation. A significant relationship

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Table 5. Relationship between health status, demographic characteristics and frailty.

Characteristic		Physical health*		Social health**		Mental health***	
		χ^2	p	χ^2	p	χ^2	p
Age	≤79	**3.377**	**0.032**	2.596	0.065	**3.766**	**0.028**
	≥80						
Gender	Female	0.648	0.421	0.280	0.597	**5.034**	**0.011**
	Male						
Level of education	0–3 years	**4.563**	**0.019**	**4.172**	**0.021**	2.875	0.057
	≥4 years						
Civil status	With partner	0.256	0.613	0.867	0.352	0.017	0.983
	Without partner						
Living arrangement	Alone	0.012	0.937	**3.103**	**0.041**	2.932	0.053
	≥1						
Monthly income	≤500 TRY	**3.029**	**0.044**	0.954	1.068	0.227	0.634
	≥501 TRY						
Frailty		**4.853**	**0.017**	**5.173**	**0.010**	**8.981**	**<0.001**

* Individuals showing no co-morbidities and no inappropriate medication use were considered to be physical healthy. ** Individuals who were satisfied with their social life were considered to be socially healthy. *** Individuals with no cognitive and emotional problems were considered to be mentally healthy. Cases were grouped using the total SMMS and GDS scores as the mental health score.

was found between depression and women, lower economic level, co-morbidities, overweight status, caregiver burden, and social isolation. No relationship was found between the depression score and age, education levels, and living arrangements (Table 4). There was a significant relationship between frailty and the physical, social and mental health status of the participants. Significant differences were found between physical health and older age, lower education level, and lower monthly income. A significant relationship was found between social health and a low level of education and living alone. It was observed that the difference between social health and older age neared the level of statistical significance. There was a significant difference between mental health and women and older age. There was also a difference between mental health and less education and living alone, which neared the level of significance (Table 5).

Discussion

This study was the first conducted in this geographical region. To the best of my knowledge, no previous studies have measured the frailty of elderly adults, even in urban areas of Turkey. In many international studies, it has been shown that regional (rural and urban) disparities affect the health of the elderly [4,5,9,21]. A study conducted in an urban area of Turkey examined the prevalence of and risk factors for depression and reported the general health status and frequency of chronic diseases in older people living in that urban area. In comparison with the results from this previous study, a similar percentage of chronic diseases was observed in the participants of the present study. In the earlier study, the authors stated that the study population had formerly migrated from a rural area of Turkey, and it was determined that the depression rate was almost 2-fold higher than in the rural area [22]. The current study was performed only in a rural area, and not an urban area, because the author conducted this study alone and the applied methodology was time-consuming. Therefore, 1 limitation of this study is its small sample size. In this study, the prevalence of frailty was 7.1%, and the pre-frailty rate was 47.3%. These results are similar to the rates in the United States and some European countries, where the overall prevalence of frailty was found to be 6.9% [6]. In the United States, the reported prevalence of frailty ranges from 6.9% to 18.5%. In a study from Europe, the prevalence of frailty was observed to be 17%. The highest frailty rate reported (27.3%) was in Spain. However, in another study from Spain, it was found that the prevalence of frailty was only 9.6% [8]. Other European countries have reported a lower prevalence rate (8.8%). Curcio et al. recently reported the prevalence of frailty to be 12.2% in a rural area of Colombia. These authors stated that the diversity of results regarding the prevalence of frailty depends on the use of heterogeneous frailty criteria for assessment [9]. In comparing these results with the developmental rankings of

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other countries, the percentage of frailty was found to be relatively low in the rural areas of Turkey (Turkey ranked 90 out of 186 countries, according to the 2013 Human Development Report [Human Development Index, 0.722; index including life expectancy]) [23]. Although the results were not representative of the elderly living in rural areas of Turkey, the relatively lower percentage of frailty, even in a rural area, may be the results of the increased rate of a high functional status among the participants. It is known that functional disability is the main risk factor for frailty [24]. Peterson et al. reported that physical activity prevents frailty [25]. The second reason for the low percentage of frailty might be the greater social well being of the individuals examined in the current study, as social vulnerability has a significant negative effect on the health of older people [26]. Only 4 persons reported living alone, and 95.2% of the population was satisfied with their social life. A third reason could be the low mean age of the participants in this study. These 3 explanations are considered the main potential reasons for the low percentage of frailty in this study group.

Consistent with previous studies, the results of the current study showed an association between frailty and older age [6,9,27]. A surprising finding was that the mean age of men was greater than that of women. When the subjects were classified by gender, no relationship with frailty was found. In the literature, various results are reported regarding the relationship between gender and frailty. Some studies indicate a higher percentage of frailty in men, some in women, and some report no difference between men and women [8,9,24,27]. In the rural area in which this study was conducted, people work primarily in agriculture and animal husbandry and rarely use machines. In this work, women are traditionally more physically active than men. Hence, this intense physical work may lead women to be stronger, decreasing functional disability. In the frailty group, there was no difference in physical activity or muscle strength (adjusted for gender) between women and men. It is well known that a low education level and a low economic level decrease health-related quality of life. In the current study, participants who were less educated and exhibited a low economic level were frailer. In a study from Brazil, it was demonstrated that a lack of schooling and living in a rental house were the main risk factors for functional disability, regardless of gender [27]. In their study, Curcio et al. also reported more frequent frailty in individuals with less education [9].

Previous studies have demonstrated that co-morbidity and polypharmacy are important risk factors for frailty and functional disability in elderly adults [6,8]. In the present study, a strong relationship was also detected between co-morbidity and polypharmacy, although the co-morbidity and polypharmacy rates were relatively lower in this study group. A recently published study evaluating the health status of elderly women from an urban area of Turkey reported higher rates of co-morbidity and polypharmacy in elderly women than were found in the present study [28]. Fried et al. demonstrated a relationship between frailty and cardiovascular, pulmonary diseases, and diabetes. These authors also suggested etiologic associations with these individual diseases and frailty. However, they reported a greater likelihood of frailty if 2 or more diseases were present than if only 1 was present [6].

In the current descriptive, cross-sectional study, it is difficult to determine casualty for frailty. Interestingly, in the current study, a significant relationship was found between frailty and gastric problems, urinary incontinence, benign prostate hyperplasia, auditory impairment, and worse oral care, in addition to DM and COPD. Rodrigues et al. demonstrated a relationship between frailty and visual impairment [27]. In their study, they also demonstrated that being overweight is a risk factor for functional disability. In the current study, there was no significant relationship detected between frailty and being overweight. Additionally, none of the participants were at risk for malnutrition. However, this study was not longitudinal, and nutritional status was assessed based on an interview and unintentional weight loss based on self-report, without baseline weight scores, constituting a limitation of the study. In many international studies, a relationship between frailty and arthritis has been detected [6,9,24]. Consistent with these results, a statistically significant difference was found between frailty and arthritis and generalized pain in participants. These results support the cycle of frailty hypothesis put forth by Fried et al. (musculoskeletal changes and sarcopenia→↓strength and power→↓walking speed→↓activity→↓total energy expenditure→↓chronic under nutrition→negative energy balance→frailty) [6]. It was observed that a lower percentage of elderly participants required caregiver help, and this group was frailer. The social well-being of elderly adults was higher in this study group. The participants who were satisfied with their social life and support were significantly less frail. These findings are consistent with a study by Andrew et al. demonstrating that social isolation and vulnerability are associated with older adults' health [26].

Cognitive impairment is a well-known risk factor for many geriatric outcomes [5]. It has been shown that frailty develops earlier and is more severe in people with intellectual disabilities [29]. Consistent with these findings, an association was observed between cognitive impairment and frailty in the current cases. Many international studies have reported that frailty is not only a physiological state but also an emotional, cognitive, and social state [5,8,9,26,29]. In a systematic review, Vries et al. suggested that the cognition, mood, and social support of elderly adults should be added to existing frailty instruments [7]. However, the Clinical Frailty Scale developed by Rockwood

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et al. included cognitive impairment criteria, which were not employed in this study because of the use of a judgement-based scale [21]. Consistent with worldwide reports, a significant relationship was found between depression and frailty in the participants of this study [8,9,21,27]. A study from the United States reported that the mental and physical health of the caregivers was also negatively affected in geriatric patient care [30]. The most striking relationship was observed among the non-frail group, who exhibited a significantly less impaired functional status, less cognitive impairment, less depression, and a high social well-being status. Based on these results, the primary public health objective must be to maintain the well-being and independence of the elderly population. With this goal, geriatric services in public health care should be intensified to provide the elderly with independence (i.e., that they be functionally active), easy access to medical care, and sustainable long-term care to protect against frailty. In this study, it was determined that there is a significant relationship between chronic diseases and frailty. In addition to combating chronic diseases, the public health community organization must strive to provide physical activities and healthy nutrition programmes for the elderly population. It has been demonstrated that social well-being plays an important role in the health of elderly adults. Therefore, public health organizations must endeavor to meet the social needs of older adults. Preventive care is always an easy and cost-effective way to avoid health problems. To promote healthy aging, an educational program must be included in public health education to teach healthy behavior at an early age. The national government is responsible for organizing the entities that provide for the needs of the elderly. As evidenced by the developed countries, well-organized public health services depend on economic conditions. Public health policies must be structured according to the needs of the geriatric population and aimed at promoting the well-being of the elderly, particularly those who reside in rural areas. This study was not designed to discuss the frailty criteria; however, it was observed that cognitive impairment, depression, and a lack of social support were significantly related to frailty, even in this small sample. These findings suggest that it is necessary to add the physiological, cognitive, and social domains to frailty measurements. In the current study group, the participants were in relatively good physical health and were less frail. It is expected that new studies will investigate frailty in rural and urban areas of Turkey for comparison with these results.

Conclusions

Measurement of frailty is essential for geriatrics and health care policy, especially for elderly adults living in rural areas where there are many difficulties in accessing health care services. Because frailty is predictable and preventable, the identification of pre-frail individuals in need of special interventions makes it possible to increase their quality of life and delay the onset of the disability. The results of this study were consistent with other reports indicating that frailty is related to older age, lower economic level, lack of education, functional disability, comorbidities, polypharmacy, cognitive impairment, depression, and lack of social support. The main purpose of this research was to evaluate the frailty of elderly adults living in a rural area. In this context, a great deal of important knowledge was obtained from this study regarding the general health status and social context of people living in this area. By providing data-based evidence, it is believed that this study will contribute considerably to understanding the health status and needs of elderly adults and the problems with well-being in this population. The results will further aid in planning the development of public health and geriatric services based on regional needs.

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Statement

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