The Effect of Frailty on Falls
Kırılganlığın Düşmelere Etkisi

H.Ü. Sağlık Bilimleri Fakültesi Dergisi
Cilt: 11, Sayı: 3, 2024
Doi: 10.21020/husbfd.1421343

Özgün Araştırma

Huzurevinde Yaşayan Yaşlılarda Kırılganlık ve Düşme Riski Arasındaki İlişkinin Belirlenmesi

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Gönderim Tarihi: 17 Ocak, 2024 **Kabul Tarihi:** 3 Haziran, 2024 **Basım Tarihi:** 31 Aralık, 2024
Erken Görünüm Tarihi: 11 Ekim, 2024

Öz

Amaç: Çalışmanın amacı huzurevinde yaşayan yaşlıların kırılganlık düzeyi ile düşme riski arasındaki ilişkiyi belirlemek ve bu konuya dikkat çekmektir.
Yöntem: Kesitsel ve tanımlayıcı tipteki bu çalışma, 2 Ocak 2023 ile 15 Ocak 2023 tarihleri arasında Adana ilindeki devlete ait iki huzurevinde gerçekleştirilmiştir. Çalışma araştırma kriterlerine uyan ve çalışmaya katılmayı kabul eden toplam 220 yaşlı ile yüzyüze görüşme yöntemi ile yürütülmüştür. Veri toplanmasında Kişisel Bilgi Formu, İtaki Düşme Risk Endeksi ve Edmonton Kırılganlık Ölçeği kullanılmıştır.
Bulgular: Katılımcıların %63,6'sı kadın olup, yaş ortalaması 76±8 (min=60, max=98) idi. Kadın cinsiyet (%58,3), normal BKI (%54,9), düzenli egzersiz yapmama (%85,4), kronik hastalık varlığı (%55,6), yardımcı cihaz kullanımı (%85,6), düşme öyküsü (%63,9) ve hastaneye yatış öyküsü (%61,1) ile düşme risk düzeyi arasında istatistiksel olarak anlamlı ilişki bulundu ($p<0,05$). Normal BKI (%60), düzenli egzersiz yapmama (%70), kronik hastalık varlığı (%70), kullanılan ilaç sayısının 1-3 olması (%55), yardımcı cihaz kullanımı (%97,5), düşme öyküsü (%100) ve hastaneye yatış öyküsü (%72,5) ile ciddi kırılganlık risk düzeyi arasında istatistiksel olarak anlamlı ilişki bulundu ($p<0,05$). Kırılganlık düzeyi ile düşme riski arasında istatistiksel olarak anlamlı bir ilişki bulundu ($p<0,01$).
Sonuç: Orta ve ileri derecede kırılganlık düzeyine sahip yaşlıların düşme riskinin yüksek olduğu belirlendi.

Anahtar kelimeler: *kaza sonucu düşmeler, kırılgan yaşlılar, huzurevleri, risk değerlendirmesi.*

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Original Research

Determining the Relationship Between Frailty and Fall Risk in Elderly People Living in Nursing Homes

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Submission Date: January 17th, 2024 **Acceptance Date:** June 3rd, 2024 **Pub.Date:** December 31st, 2024
Online First Date: October 11th, 2024

Abstract

Objective: The study aimed to determine the relationship between the level of frailty and the risk of falls in the elderly living in nursing homes and to draw attention to this issue.
Method: The cross-sectional and descriptive study was conducted in two state-owned nursing homes in Adana between January 2, 2023, and January 15, 2023. The study was conducted by face-to-face interviews with a total of 220 elderly people who met the research criteria and agreed to participate in the study. Data were collected using the Personal Information Form, Itaki Fall Risk Index, and Edmonton Frailty Scale.
Results: 63,6% of the participants were women, and the average age was 76±8 (min=60, max=98). Female gender (58,3%), normal BMI (54,9%), lack of regular exercise (85,4%), presence of chronic disease (55,6%), use of assistive devices (85,6%), history of falling A statistically significant relationship was found between (63,9%) and hospitalization history (61,1%) and fall risk level ($p<0.05$). Normal BMI (60%), lack of regular exercise (70%), presence of chronic disease (70%), number of medications used 1-3 (55%), use of assistive devices (97,5%), history of falling (100%), a statistically significant relationship was found between the history of hospitalization (72,5%) and the risk level of severe frailty ($p<0,05$). A statistically significant relationship was found between frailty level and fall risk ($p = 0,00$).
Conclusion: Elderly people with moderate and severe frailty were found to be at high risk of falls.

Keywords: *accidental falls, frail elderly, nursing homes, risk assessment.*

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Introduction

Ageing is an inevitable, irreversible process that continues from birth to death, affecting many structural and functional functions throughout the body. The last stage of this process is defined as old age (Kablan et al., 2020). The elderly population is increasing rapidly in our country. TÜİK reports that the ratio of the elderly population to the total population, which was 9.7% in 2020, will be 11-12% in 2025-2030 (Turkish Statistical Institution (TUIK), 2020). The term geriatric syndrome is used to describe clinical conditions that have multiple aetiologies, such as age-related physiological changes, concomitant diseases, and stress factors, and cannot be explained by the disease definition (Bildik, 2019). Frailty is among these syndromes (Kang et al., 2021). The prevalence of frailty varies between 4,9-27,3% worldwide, while pre-frailty ranges from 34,6-50,9% (Davinelli et al., 2021). When studies conducted in Turkey are examined, it is stated that the fragility rates are on average 44,5% (Pala & Yalçın, 2020). In addition to fragility, falls negatively affect the health of the elderly and are the second leading cause of death from unintentional injuries worldwide. It is estimated that 684,000 people die from falls each year worldwide, with more than 80% of them in low- and middle-income countries. The people most likely to experience a fatal fall are adults over the age of 60 World Health Organization (WHO, 2021).

Although there is no universally accepted definition of frailty, experts agree that it is a disease state in which vulnerability increases and resistance to stressors that can cause functional impairment and increase risks decreases. Stressful situations such as falls or infections can worsen a person's health and increase addiction and mortality (Canbolat, 2021; Düzgün et al., 2021). The decline in muscle mass and muscle strength are the basic physiological components of frailty, and factors such as acute and chronic diseases, chronic inflammation, environmental factors (stress, malnutrition, etc.), and genetics may play a role in the pathogenesis of frailty (Alkan & Rakıcıoğlu, 2019; Marzetti et al., 2019). Vermeiren et al. (2016) reported that frailty increases the risk of physical disability by 1.5-2.6 times, the risk of falls or fractures by 1.2-2.8 times, the risk of losing activities of daily living by 1.6-2.0 times, and the risk of hospitalization by 1.2-1.8 times (Vermeiren et al., 2016).

Falls, which can also lead to disability and addiction, can cause psychosocial problems and an increase in health expenses for both the elderly and their families (Araujo et al., 2017). These results make falling an important health problem in society (Kibar et al., 2015; Lee et al., 2018). In order to carry out prevention programs, it is necessary to identify the factors that cause recurrent falls in the elderly (Yoo et al., 2019). Frailty is a dynamic condition that

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affects the elderly due to loss of function in physical, psychological and social areas, and morbidity and mortality can be reduced with early diagnosis, preventive or therapeutic measures (Arslan et al., 2018). In light of all this information, this study was planned to determine the frailty level of the elderly living in nursing homes and the relationship between fall risk and frailty and to draw attention to this issue.

Research Question

1. Is there a relationship between frailty and fall risk?

Materials and Methods

Research Type

This research was conducted cross-sectionally**.**

Participants and Procedure

This cross-sectional study was conducted in two state-owned nursing homes in Adana province between January 2, 2023, and January 15, 2023. All care and treatment services for the elderly are provided in the nursing home. Elderly people who met the inclusion criteria (over 65 years of age, lived in a nursing home for at least 6 months, did not have dementia, could be contacted) and agreed to participate in the study were included in the study. It was aimed at reaching a total of 312 elderly people living in two nursing homes as a sample. The study was conducted with 220 elderly people because 81 elderly people were diagnosed with dementia and 11 elderly people did not agree to participate in the study. Ethical approval for this study was first obtained from the Çukurova University, Faculty of Medicine Non-invasive Clinical Research Ethics Committee (date: 03.06.2022, no:123) and all rules of the Declaration of Helsinki were followed. First of all, participants were informed about the study and verbal and written consent was obtained from the volunteers. The questionnaires were administered by the researcher to the elderly living in the nursing home and meeting the research criteria by face-to-face interview method.

Data Collection Tools

In this study, Personal Information Form, Itaki Falls Risk Index and Edmonton Frailty Scale were used in face-to-face interviews with older adults aged 65 years and over.

Personal Information Form

It consists of a total of 10 questions (gender, age, body mass index (BMI), education level, exercise status, duration of stay in a nursing home, smoking, number of medications

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used, history of falls, and presence of chronic disease) prepared by the researchers by provide references.

Itaki Fall Risk Index

The Itaki Fall Risk Scale was developed by the commission formed by the Ministry of Health Turkiye in 2011 within the scope of the study of developing a scale specific to our country by reviewing the literature and examining the different fall risk scales used in institutions. There are a total of 19 items on the scale. The scale score is created by summing the scores of all items. If the total score is between 0 and 4, it is considered low risk; 5 points and above is considered high risk (Tezcan & Karabacak, 2021).

Edmonton Frail Scale

Developed by Rolfson et al. (2006) to evaluate frailty in the elderly (Rolfson et al., 2006). In our country, Aygör carried out the validity and reliability study of the scale. The scale consists of 11 questions and is evaluated in the range of 0–20 points. If the score obtained from the scale is in the range of 0-4, the elderly person is not frailty. A score of 5–6 is considered visibly vulnerable; a score of 7-8 is considered slightly frailty; a score of 9–10 is considered moderately frailty; and a score of 11 and above is considered severely vulnerable (Aygör, 2013).

Statistical Analysis

The data obtained were evaluated using the SPSS (Statistical Package of Social Science version 21) package program. While evaluating the findings obtained in the study, Pearson Chi-Square analysis was used to compare quantitative data as well as descriptive statistical methods (mean, standard deviation). The results were evaluated at the 95% confidence interval and the significance level of $p<0,05$.

Results

The general characteristics of the participants are examined in Table 1. 63,6% of the participants were women, 36,3% were elementary school graduates, and 51,4% were of normal weight. While 64,1% of the participants did not exercise, 80,5% did not smoke. The rate of participants using 4 or more medications was found to be 28,6%, the rate of having a chronic disease was 49,5%, the rate of fall history was 50%, the rate of using assistive devices was 62,7%, and the rate of previous hospital admission was 32,3%. In addition, the average age of the participants is 76±8 (min=60, max=98), the average number of years of stay in a

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nursing home is 3,5±3 (min=1, max=15), and the average number of medications used is 3±2 (min=0, max=13) (Table 1).

Table 1. Evaluation of the General Characteristics of the Participants (n=220)

Variables	**n**	**%**
Gender		
Woman	140	63,6
Male	80	36,4
Educational Status		
Illiterate	71	32.3
Literate	21	9,5
Elementary school	80	36,3
High school graduate	32	14,5
Bachelor's degree	16	7,3
BMI		
Weak	12	5,5
Normal	113	51,4
Overweight	71	32,2
Obese	24	10,9
Exercise Status		
Yes	79	35,9
No	141	64,1
Smoking		
Yes	43	19,5
No	177	80,5
Number of medication in use		
Not using	32	14,5
1-3 medications	125	56,8
4 or more medications	63	28,6
Presence of Chronic Disease		
Yes	109	49,5
No	111	50,5
Assistive Device Use		
Yes	138	62,7
No	82	37,3
Fall Story		
Yes	110	50
No	110	50
Previous hospital admission		
Yes	71	32,3
No	149	67,7
Variables	**Mean±SD**	**Min-Max**
Age	76±8	60-98
Duration of Stay in Nursing Home (years)	3,5±3	1-15

*Data are expressed as numbers (n), frequency (%), mean±SD and min-max. BMI=Body Mass Index

Table 2 compares the personal characteristics of the participants and their fall risk level. A statistically significant relationship was found between gender, BMI, regular exercise status, presence of chronic disease, use of assistive devices, fall story and previous hospital admission, and fall risk level (respectively, p=0,02, p=0,04, p=0,00, p=0,01, p=0,00, p=0,00, p=0,00). In female participants (58,3%), in those with normal weight (54,9%), in those who

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do not exercise regularly (85,4%), in those with chronic diseases (55,6%), and in those using assistive devices (85,6%), a high risk of falling was found in those with a fall story (63,9%) and those with no previous hospital admission (61,1%) (Table 2).

Table 2. Comparison of Participants' Personal Characteristics and Fall Risk Levels

Variables	**Itaki Fall Risk Scale Score**				**Statistical Probability Value**
	Low Risk (0-4 points)		High Risk (5 points and above)		
Gender	n	%	n	%	
Woman	56	73,7	84	58,3	X^2=5,06
Male	20	26,3	60	41,7	**p=0,02***
BMI					
Poor (under 18,5 m^2)	2	2,7	10	6,9	
Normal (18,5-24,9 m^2)	34	44,7	79	54,9	X^2=8,19
Overweight (25-29,9 m^2)	31	40,8	40	27,8	**p=0,04***
Obese (30 m^2 and above)	9	11,8	15	10,4	
Educational Status					
Illiterate	23	30,3	48	46,5	
Literate	8	10,5	13	13,7	X^2=2,60
Elementary school	30	39,5	50	52,3	p=0,76
High school	12	15,8	20	20,9	
Bachelor's degree and above	3	3,9	13	10,5	
Regular Exercise Status					
Yes	61	80,3	21	14,6	X^2=91,7
No	15	19,7	123	85,4	**p=0,00***
Presence of Chronic Disease					
Yes	29	38,2	80	55,6	X^2=6,02
No	47	61,8	64	44,4	**p=0,01***
Smoking Status					
Yes	15	19,7	28	19,4	X^2=1,04
No	61	80,3	116	80,6	p=0,20
Number of medication in use					
Not using	10	13,2	22	15,2	
1-3 medications	46	60,5	79	54,9	X^2=0,70
4 or more medications	20	26,3	43	29,9	p=0,70
Assistive device usage status					
Yes	20	14,4	91	85,6	X^2=67,8
No	56	69,1	25	30,9	**p=0,00***
Fall Story					
Yes	18	23,7	92	63,9	X^2=8,04
No	58	76,3	52	36,1	**p=0,00***
Previous hospital admission					
Yes	15	19,7	56	38,9	X^2=8,90
No	61	80,3	88	61,1	**p=0,00***

*Note. Bold values indicate statistical significance (p<,05). Data are expressed as mean, percentile and Pearson Chi-Square test

Table 3 compares the personal characteristics of the participants and their vulnerability levels. A statistically significant relationship was found between BMI, regular exercise status, presence of chronic disease, number of medications used, use of assistive devices, fall story, hospitalisation history, and frailty risk level (respectively, p=0,03, p=0,02, p=0,00, p=0,01,

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p=0,00, p=0,00, p=0,00). Severe frailty level is found in those Those who are normal according to BMI (60%), those who do not exercise regularly (70%), those who have chronic diseases (70%), those who use 1-3 medications (55%), and those who use assistive devices (97,5%). Severe frailty was found to be higher in those with a history of falls (100%) and previous hospitalization (72.5%) (Table 3).

Table 3. Comparison of Participants' Personal Characteristics and Frailty Levels

Variable	**Edmonton Frail Risk Scale Score**										
	Not fragile (0-4 points)		Seemingly defenseless (5-6 points)		Slightly brittle (7-8 points)		Moderately brittle (9-10 points)		Severe frailty (11 points and above)		Statistical Probability Value
Gender	n	%	n	%	n	%	n	%	n	%	
Woman	27	71,1	26	70,3	28	58,3	39	68,4	20	50	X^2=5,96
Male	11	28,9	11	29,7	20	41,7	18	31,6	20	50	p=0,20
BMI (m2)											
Poor (under 18,5 m^2)	5	13,2	2	5,4	0	0	2	3,5	3	7,5	
Normal (18,5-24,9m^2)	12	32,6	17	45,9	25	52,1	35	61,4	24	60	X^2=21,8
Overweight (25-29,9m^2)	18	47,4	11	29,7	16	33,3	14	24,6	12	30	**p=0,03***
Obese (30m^2 and above)	3	7,9	7	18,9	7	14,6	6	10,5	1	2,5	
Educational Status											
Illiterate	7	18,4	9	24,3	12	25	28	49,1	15	37,5	
Literate	3	7,9	7	18,9	5	10,4	4	7	2	5	
Elementary school	16	42,1	14	37,8	18	37,5	18	31,6	14	35	X^2=25,7
High school	10	26,3	2	5,4	9	18,8	5	8,8	6	15	p=0,05
Bachelor's degree and above	2	5,3	5	13,6	4	8,3	2	3,5	3	7,5	
Regular Exercise Status											
Yes	21	55,3	14	37,8	16	33,3	19	33,3	12	30	X^2=6,86
No	17	44,7	23	62,2	32	66,7	38	66,7	28	70	**p=0,02***
Presence of Chronic Disease											
Yes	12	31,6	12	32,4	21	43,8	36	63,2	28	70	X^2=20,8
No	26	68,4	25	67,6	27	56,3	21	36,8	12	30	**p=0,00***
Smoking Status											
Yes	11	28,9	6	16,2	9	18,8	8	14	9	22,5	X^2=3,73
No	27	71,1	31	83,8	39	81,3	49	86	31	77,5	p=0,44
Number of medication in use											
Not using	11	28,9	6	16,2	6	12,5	4	7	5	12,5	
1-3 medications	20	52,6	20	54,1	30	62,5	33	57,9	22	55	X^2=11,1
4 or more medications	7	18,4	11	29,7	12	25	20	35,1	13	32,5	**p=0,01***
Assistive device usage status											
Yes	19	50	12	32,4	30	62,5	39	68,4	39	97,5	X^2=38,8
No	19	50	25	67,6	18	37,5	18	31,6	1	2,5	**p=0,00***
Fall Story											
Yes	0	0	0	0	29	60,4	41	71,9	40	100	X^2=128
No	38	100	37	100	19	39,6	16	28,1	0	0	**p=0,00***
Previous hospital admission											
Yes	0	0	10	27	5	10,4	27	47,4	29	72,5	X^2=67,9
No	38	100	27	73	43	89,6	30	52,6	10	27,5	**p=0,00***

*Note. Bold values indicate statistical significance (p<,05). Data are expressed as mean, percentile and Pearson Chi-Square test.

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Table 4 compares the Frailty Levels and Fall Risk Levels of the participants. A statistically significant relationship was found between frailty level and fall risk (p=0,00). Table 4 compares the Frailty Levels and Fall Risk Levels of the participants. A statistically significant relationship was found between frailty level and fall risk (p=0,00). Participants with moderate (29.9%) and severe (22.2%) frailty levels were found to be at high risk for falls (p=0.00) (Table 4).

Table 4. Comparison of Participants' Frailty Levels and Fall Risk Levels

Edmonton Frail Risk Scale Score	**Itaki Fall Risk Scale Score**				**Statistical Probability Value**
	Low Risk (0-4 points)		High risk (5 points and above)		
	n	%	n	%	
Not brittle (0-5 points)	27	35,5	11	7,6	X^2=29,5 **p=0,00***
Apparently defenseless (5-6 points)	10	13,2	27	18,8	
Slightly frailty (7-8 points)	17	22,4	31	21,5	
Moderately frailty (9-10 points)	14	18,4	43	29,9	
Severe frailty (11 points and above)	8	10,5	32	22,2	

*Note. Bold values indicate statistical significance (p<,05). Data are expressed as mean, percentile and Pearson Chi-Square test

Diccussion and Conclusion

Frailty is an important indicator in determining the health status and care needs of elderly individuals (Düzgün et al., 2021). Frailty is reported to be associated with an increased risk of falls, injuries, hospitalizations, increased mortality, and higher costs (Davinelli et al., 2021; Resciniti et al., 2019; Thiruchelvam et al., 2021). Since frailty is a reversible condition when detected early, it is very important for healthcare professionals to identify elderly individuals in the fragile/pre-frail period and take the necessary precautions (Özşaker, 2023). In the study by Düzgün et al. (2021) evaluating frailty in the elderly; A significant relationship was found between advanced age, low education and income levels, continuous medication use, and a fall history within one year and frailty (Düzgün et al., 2021). Liu et al. (2020) reported age, female gender, staying in a nursing home, not exercising regularly, and poor health as factors associated with frailty in their study with 1004 people living in nursing homes (Liu et al., 2020). According to a study conducted in China, the risk factors for frailty are advanced age, female gender, limitations in daily living activities, and three or more chronic diseases (He et al., 2019). There are studies reporting body mass index as a risk for frailty (Kapucu & Unver, 2017). Although assistive device use has not been reported as directly related to frailty, it has been reported as a factor that increases the risk of falling (Bruce et al., 2017). In accordance with the literature, severe frailty was found in the elderly

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who were normal according to BMI, did not exercise regularly, had chronic diseases, used four or more medications, used assistive devices, had a history of falls and had a history of hospitalization (Table 3). It is thought that regular assessment of the elderly with a validated scale in terms of risks that increase frailty is important for early diagnosis of frailty. It is thought that regular evaluation of the elderly with a valid scale in terms of risks that increase fragility is important in the early diagnosis of frailty.

Falling is a common problem in the elderly and can subsequently lead to fractures, increased need for care, fear of falling, decreased activity and independence, and even death (Uzun, 2018). In the report published in 2007, World Health Organization (WHO) drew attention to falls in the elderly and reported that it was the most common reason for hospital admission in old age (WHO, 2007). It is reported in the literature that fragility and its components negatively affect the risk of falling and balance (Arabacı et al., 2023; Cheng & Chang, 2017; Keskin, 2019). In the literature, age, gender, comorbidities, previous falls, functional dependency, and the number of medications used are reported as risk factors for falls (Aktürk & Ister, 2019; Sharif et al., 2018). In his study, Özcan (2022) states age, gender, body mass index, and use of assistive devices as risk factors for falling (Özcan, 2022). When the study results were examined, it was determined that, in line with the literature, female gender, lack of exercise, presence of chronic disease, use of assistive devices, fall history and normal BMI were risk factors that increased falls in the elderly. Different results regarding BMI are reported in the literature. In addition to studies reporting that the risk of falling is higher in elderly people with low and high BMI (Koçyiğit et al., 2021; Öztürk et al., 2018), there are also studies reporting that the risk of falling is high in those with normal BMI (Özcan, 2022). Some studies report that there is no relationship between fall risk and BMI (Çevik et al., 2020; Mortazavi et al., 2018). Regular assessment of the fall risk of elderly people living in nursing homes with valid and reliable scales may be effective in taking the necessary measures to prevent falls. Frailty is defined as the impairment of many interrelated physiological systems. It is a syndrome characterized by inactivity, burnout, weight loss, and weakness in muscle strength, as well as increased risks such as falls, depression, disability, and mortality (Herr et al., 2019; Pansarasa et al, 2019). The negative effects of frailty on fall risk and balance are also reported in studies (Gencer et al., 2021; Keskin 2019). In the study, the risk of falling was found to be high in elderly people with severe frailty levels, consistent with the literature (Table 4). It is thought that early diagnosis and treatment of frailty in elderly people living in nursing homes may be effective in reducing the risk of falling.

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Frailty in the elderly is a syndrome that can be treated with a multidisciplinary approach. It is important to periodically evaluate elderly people living in nursing homes with valid and reliable scales in terms of frailty syndrome and fall risk. In this way, frailty can be diagnosed early and its progression slowed or stopped. The risk of falling, which is an important factor in increasing morbidity and mortality in the elderly, increases with frailty. In the context of all this information, if the necessary interventions are made on time and in place, both frailty syndrome and falls that increase with fragility can decrease and the quality of life of the elderly can be positively affected.

Strengths and Limitations of the Research

The shortcoming of the study is that only the elderly living in two state-run nursing homes in Adana province were analyzed. The strengths of the study are that 75.5% of the target population was reached and that it was conducted in two nursing homes with the largest elderly capacity in the province.

Acknowledgement

We thank the nursing home residents who voluntarily agreed to participate in this study and answered the questions sincerely.

Funding

No financial support was received within the scope of the study

Conflict of interests

The authors declare they have no potential conflict of interest regarding the investigation, authorship, and/or publication of this article.

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Cilt: 11, Sayı: 3, 2024
Doi: 10.21020/husbfd.1421343

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