Aging Clinical and Experimental Research
https://doi.org/10.1007/s40520-021-02011-w

ORIGINAL ARTICLE

Identifying relationships between kinesiophobia, functional level, mobility, and pain in older adults after surgery

Aylin Aydin Sayilan[1] · Asuman Saltan[2] · Selda Mert[3] · Handan Ankarali[4]

Received: 26 April 2021 / Accepted: 18 October 2021

Abstract

Background Further data on the causes of functional independence or disability after surgery are needed to explain the clinical decision-making process for older patients, their families, and policy-makers. There are a limited number of studies showing the relationship between kinesiophobia, functional status, pain and mobility in older adults after surgery.

Aims The study aims to investigate relationships among kinesiophobia, pain, mobility, and functional status in older adults after surgery.

Methods A comparative–descriptive and cross-sectional study. The research was conducted with 99 older adults in the general surgery clinic after surgery. A Visual Analogue Scale was used to evaluate pain levels, the Standardized Mini-Mental State Examination to evaluate mental function status, the Functional Independence Measure to assess functional independence in daily activities, the Rivermead Mobility Index to evaluate basic mobility in daily life, and the Tampa Scale for Kinesiophobia to assess fear of mobility.

Results Regression analysis revealed a significant negative correlation between social security and kinesiophobia, and also between functional level and type of anesthesia and mental status in older women ($R^2 = -0.185$, $p = 0.005$; $R^2 = -0.167$, $p = 0.011$ and $p = 0.005$, respectively).

Discussion In the literature, there are no standardized procedures during the evaluation and rehabilitation of older adults after abdominal or thoracic surgery, etc. operations. This study will contribute to the current literature by attracting interest in this field and increasing the evaluations performed.

Conclusions The study findings emphasize the importance of evaluating the functional, mobility, mental and kinesiophobic status of older adults after surgery in clinics, rehabilitation centers, or research.

Keywords Fear · Movement · Nurses · Postoperative pain · Rehabilitation

Introduction

Old age is the final stage of human life, an inevitable and irreversible process with physiological, psychological and socio-economic components [1]. By 2023, one-tenth of the population of Turkey will be 65 or older, and the 85-plus age group is the fastest growing segment of the population. As the population ages, the ratio of surgical procedures in the older population is growing [2, 3].

Surgery may result in various morbid states in older adults, such as disability and loss of independence. Recent research by Berian et al. [4] has shown that loss of independence after surgery in older adults is related to postoperative complications and readmission in many types of operation. However, the number of studies in which functional evaluation has been performed after major surgery is low

✉ Asuman Saltan
fzt_asuman@yahoo.com.tr

1 Department of Nursing, Faculty of Health Sciences, Kırklareli University, Kırklareli, Turkey

2 Department of Physiotherapy and Rehabilitation, Faculty of Health Sciences, Yalova University, Yalova, Turkey

3 Department of Medical Services and Techniques, Kocaeli Vocational School of Health Services, Kocaeli University, Kocaeli, Turkey

4 Department of Medical Informatics, School of Medicine and Biostatistics, Medeniyet University, Istanbul, Turkey

Published online: 27 October 2021

[1, 3, 5]. In one recent systematic review, Oresanya et al. [5] concluded that there was a need for postoperative functional assessment after surgery and for studies investigating functionality.

Despite the increasing number of surgical procedures being performed as technology advances, little is known about whether or not preoperative function levels will be restored. Research has shown that even if older adults have more than one chronic disease and undergo surgery, their sole consideration is functional independence. Further data on the causes of functional independence or disability after surgery are, therefore, needed to explain the clinical decision-making process for older patients, their families, and policymakers [2, 3].

Physical results consist of comparing postoperative self-reported and performance-based measurements to preoperative measures. In some studies, the postoperative functional decline and recovery of the older adult is measured in terms of length of stay in the nursing home or rehabilitation facility, or time to discharge to the care center, respectively [6–8]. Known indicators of mobility in daily life in terms of the health status of older adults include functional activities, such as stair use, ambulation, and transfer [6–8]. Previous research has focused on exclusive functional outcomes for specific types of surgery (ect. hip fracture, cardiac, abdominal, thoracic, colon, vascular, and cancer surgeries) [6, 9–11]. According to studies analyzed that reported functional outcome has been largely poor in various types of surgery [6, 11]. To the best of our knowledge, no previous study has evaluated functional outcomes in terms of kinesiophobia, pain and mobility.

However, it is seen in the literature that different frailty scales (The Emergency Surgery Frailty Index (EmSFI), The Modified 5-Item Frailty Index (5-mFI) and Charlson comorbity Index) have been developed to evaluate the clinical decision-making process of professionals after surgery [3, 12]. It is seen that these scales are frequently used in some surgical studies groups (such as orthopedics) and focus more on morbidity instead of evaluation of the function [3, 12]. In this study, it was aimed to give importance to obtaining more detailed information about the postoperative functional capacities of older adults.

The measurement of hospitalized older adults' functional capacity is used by health consultants to identify deficits at the level of the individual (and thus, to continuing the discharge planning process), but also to assess the efficacy of a treatment at the group level [3, 6, 11]. Evaluation of pain, mobility, functional status and kinesiophobia has previously been used in the literature [13]. Kinesiophobia is described as an extreme, unreasonable, and debilitating fear of physical action and activity resulting from a feeling of vulnerability to painful damage or repeat injury [14]. In addition, fear of movement may lead to abstinence, getaway, and hyper-vigilance behaviors. The severity of pain is known to affect the fear of movement and is thus associated with functional competence. However, to the best of our knowledge, little is known about the effect of gender on these functions/behaviors. Whether there is a difference between the sexes is a subject now requiring investigation [14]. Moreover, there have been fewer assessments of kinesiophobia and functional status among older adult inpatients after surgery [14, 15].

This study has null hypothesis that no relationships among kinesiophobia, pain, mobility, and functional status in older adults after surgery. The main aim of this study is to investigate relationships among kinesiophobia, pain, mobility, and functional status in older adults after surgery.

Methods

Design and participants

This comparative–descriptive and cross-sectional study was conducted in the Kırklareli province of Turkey from March to August 2016. The instant case detection method, one of the general screening models, was employed. Ninety-nine individuals (61 female, 38 male) hospitalized in the Kırklareli State Hospital General Surgery Clinic after surgery were included in the study. The sample size was selected using number cruncher statistical system–statistical analysis (NCSS) 2007 and PASS 2008 statistical software (NCSS LLC, Kaysville, UT, USA). Power analysis was performed using the G*Power (v3.1.7) program (License No: 1675948377483, Series N: N7H5-J8E5-D4G2-H5L6-W2R7). Based on previous study [16] the sample size determined for this research was 98 older adults ($\alpha = 0.05$, 1-β (Power) = 0.930 and effect size = 0.36).

Data collection

Data were collected concerning individuals' demographic characteristics, their marital and educational status, presence of chronic disease, whether they received social security, pain levels before surgery, and pain level on the day of discharge. Data concerning type of anesthesia applied, age, and body mass index (BMI) were obtained from patient files.

Approval (no. P0128R00) was obtained from the Kırklareli University ethical committee, and written permission was received from the institution, where the survey was conducted. Written, and verbal informed consent was also obtained from all participants.

Adults aged at least 65, capable of cooperating and effectively understanding and complying with the study evaluation methods and scales, with no hearing or vision problems, and volunteering to participate were included in the study.

The patients were identified from a patient list ($n = 105$) obtained from the clinic management. Individuals with hearing ($n = 2$) or vision problems, or unstable clinical condition ($n = 1$), or mental problems ($n = 3$) were excluded.

A Visual Analogue Scale (VAS) was used to assess pain levels, the Standardized Mini-Mental State Examination (SMMSE) to assess mental function status, the Rivermead Mobility Index (RMI) to assess basic mobility in daily life, the Functional Independence Measure (FIM) to assess functional independence in daily activities, and the Tampa Scale for Kinesiophobia (TSK) to assess fear of mobility. Assessments were performed at face-to-face interviews by an experienced physiotherapist and a nurse.

The VAS was applied to measure individuals' subjective assessment of their pain levels. It has been used in many previous studies to assess the severity of pain and has been found to be reliable and valid. The sensitivity, and selectivity of VAS after general surgery in Turkey were first studied by Aslan [17].

The participants were explained that the number "0" on the scale means "I do not feel any pain," while the number "10" means "I feel the most severe pain." The intensity of pain increases in line with the number value. The subjects were then asked to mark a number from 0 to 10 to express their own pain intensity level [18].

The SMMSE provides a global assessment of mental function. The scale is easily administered and provides information regarding the degree of mental impairment. A maximum of 30 points can be obtained from the test, and higher scores indicate better mental status. Scores < 23/24 for the Turkish population are suggestive of 'abnormal' cognition. Older adults with less than 5 years of education are administered the Revised SMMSE for the uneducated, while those with 5 years of education or more are administered the Regulated SMMSE for educated individuals. Scores of 24–30 are defined as normal mental dysfunction, scores of 20–23 as mild mental impairment, and scores less than 19 as moderate mental dysfunction [16]. Studies have shown the validity and reliability of the SMMSE [19].

The RMI measures mobility. It evaluates all the factors involved in moving, from easy to difficult (from turning in bed to running and consists of 14 questions and one observation in a hierarchical manner. One point is given for each affirmative answer, and potential scores range between 0 and 15. A score of 15 indicates no problem in mobility, while scores of 14 and lower indicate the presence of a mobility problem. Studies have shown the validity and reliability of the RMI its feasibility in older adults [20].

Kinesiophobia was evaluated using the Turkish version of the TSK, a 17-item questionnaire. Participants are asked to indicate their level of agreement with each of 17 statements on a four-point reply scale, with scoring options from "strongly disagree" to "strongly agree". Four items (4, 8, 12 and 16) are reverse-worded statements. Total scores range from 17 to 68, with scores greater than 37 indicating a high degree of kinesiophobia [14]. The TSK has been tested for use on patients with chronic pain and is considered to have face and content validity as well as stability over time, and internal consistency [14, 21].

The FIM assesses functional independence in daily activities by analyzing two different aspects of impairment, motor and mental functions. The scale consists of six functional sections: self-care, sphincter control, mobility, locomotion, communication, and social perception. Eighteen activities are evaluated in terms of functional independence using a seven-point scale. The highest possible score is 126. Higher scores indicate independence in daily life activities. The FIM is the most used activity assessment tool in medical rehabilitation. Studies have shown the validity and reliability of the FIM [22].

Statistical analysis

Descriptive statistics were expressed as mean ± standard deviation (SD), count and percentage, frequency and median, depending on the type of the variable. Pearson's χ^2 test was used for determining the relationship between genders and categorical demographic features. The Mann Whitney U test was applied to determine the differences in numerical characteristics between men and women. Spearman's rank correlation analysis was used to determine relationships between the evaluation parameters (kinesiophobia, postoperative pain level, mental status, mobility, functional level, and sociodemographic characteristics). Wilcoxon's rank test was applied to compare pre–post pain values in men and in women. Stepwise multiple linear regression analysis was performed to measure the effect of the independent variables (kinesiophobia, pain, mobility, functional level) on the dependent variables (age, mental status, marital status, social security, pain level on the day of discharge, and type of anesthesia) separately in both genders. p values < 0.05 were regarded as statistically significant. Data analysis was performed on SPSS software (version 22.0 for Windows).

Results

Sixty-one (61.6%) women (mean age 71.77 ± 8.21 years) and 38 (38.4%) men (mean age 71.36 ± 8.05 years) were included in the study. Mean of BMI values were 25.74 ± 3.44 in women and 25.63 ± 4.90 in men. Tables 1 and 2 show the participants' sociodemographic data, the presence of chronic illness, type of anesthesia, and information about TSK, FIM, SMMSE and RMI scores.

Negative linear correlation was found between age and kinesiophobia, and positive linear correlation between mobility and mental status in women ($R = -0.283$ and

$p=0.027$; $R=0.363$ and $p=0.004$, respectively). However, these correlations were at a low level. No correlation was found among any parameters in men ($p>0.05$) (Table 3).

Table 1 Descriptive statistics of categorical variables by gender

Categories	Genders		p*
	Women *n* (%)	Men *n* (%)	
Marital status			
Single	37 (60.7)	28 (73.7)	0.187
Married	24 (39.3)	10 (26.3)	
Educational level			
Illiterate	22 (36.1)	4 (10.5)	0.006
Primary school	12 (19.7)	9 (23.7)	
High school	25 (41.0)	21 (55.3)	
College	2 (3.3)	4 (10.5)	
Social security			
No	41 (67.2)	30 (78.9)	0.210
Yes	20 (32.8)	8 (211)	
Chronic disease			
Yes	50 (82.0)	22 (57.9)	0.009
No	11 (18.0)	16 (42.1)	
Kind of anesthesia			
General	46 (75.4)	21 (55.3)	0.038
Spinal	15 (24.6)	17 (44.7)	

*Mann Whitney *U* test

Regression analysis revealed a significant negative correlation between social security and kinesiophobia, and also between functional level and type of anesthesia and mental status in older women ($R^2=-0.185$, $p=0.005$; $R^2=-0.167$, $p=0.011$ and $p=0.005$, respectively). A significant positive correlation was also observed between mobility and mental status ($R^2=0.253$, $p=0.007$) (Table 4).

Discussion

The aim of this study was to investigate postoperative pain, kinesiophobia, mobility and functional levels among older adult inpatients. In this study the female gender, chronic disease status, and education level could be noted when determining mental state, pain, mobility, and functional level after surgery in older adults. Ownership of social security thinks as a predictive factor for kinesiophobia in older women after surgery, while mental status was a predictive factor for mobility assessment. In addition, the type of anesthesia, and marital status was found as predictive factors in functional level evaluations in women. The majority of studies involving postoperative evaluations in older adults have reported pain and kinesiophobia in the postoperative period, leading to mobility and functional disability [6, 23]. In addition, many of these studies have been performed in the context of cardiac surgery, or of knee or hip replacement, and standardized protocols are

Table 2 Descriptive analysis of pre–post-operative pain, kinesiophobia, mobility, functional level, cognitive status, duration of hospital stays by gender

Parameters	Gender	*n*	$X \pm SD$	Percentage distribution			p*
				25	Median	75	
Age (year)	Women	61	71.77 ± 8.21	65.0	68.0	76.0	0.961
	Men	38	71.36 ± 8.05	65.0	68.0	78.0	
Body Mass Index (kg/m^2)	Women	61	25.74 ± 3.44	23.33	25.80	27.83	0.436
	Men	38	25.63 ± 4.90	21.80	25.29	27.37	
Postoperative pain	Women	61	4.15 ± 2.44	2.00	4.00	6.00	0.090
	Men	38	3.29 ± 2.10	2.00	3.00	4.25	
Preoperative pain	Women	61	3.11 ± 2.04	1	3	4.5	0.272
	Men	38	2.66 ± 1.80	1	2	4	
Duration of hospital stay	Women	61	5.40 ± 6.28	1	3	7	0.835
	Men	38	5.5 ± 7.07	1.75	2.5	5.5	
Kinesiophobia	Women	61	51.82 ± 9.98	47.00	52.00	60.00	0.627
	Men	38	52.74 ± 10.41	47.75	53.50	61.00	
Mobility	Women	61	12.30 ± 1.99	10.00	12.00	14.00	0.977
	Men	38	12.29 ± 1.80	11.00	12.00	14.00	
Functional level	Women	61	113.93 ± 5.90	109.00	114.00	119.50	0.784
	Men	38	113.79 ± 5.15	109.00	114.00	118.00	
Cognitive status	Women	61	28.11 ± 1.67	27.00	28.00	29.50	0.817
	Men	38	28.16 ± 1.37	27.00	28.00	29.00	

X mean, *SD* Standard Deviation

*Mann Whitney *U* test; Wilcoxon rank test

Table 3 Relationship among kinesiophobia, mobility, functional level, cognitive status, age, body mass index, pre–post-operative pain, discharge days in women and men

Gender	Categories	Kinesiophobia	Mobility	Functional level	Cognitive status	Age (year)	Body Mass Index (kg/m^2)	Discharge days	Preoperative pain (cm)
	Postoperative pain								
Women ($n=61$)	*r*	− 0.152	− 0.064	0.015	0.038	− 0.022	− 0.022	− 0.095	− 0.096
	p	0.243	0.627	0.911	0.771	0.865	0.865	0.468	0.463
	Kinesiophobia								
	r		0.001	0.080	− 0.117	− 0.283*	0.145	− 0.006	0.046
	p		0.991	0.538	0.371	0.027	0.266	0.965	0.726
	Mobility								
	r			0.009	0.363*	− 0.154	− 0.196	− 0.023	− 0.097
	p			0.948	0.004	0.236	0.130	0.861	0.458
	Functional level								
	r				− 0.071	− 0.028	− 0.028	0.060	− 0.032
	p				0.585	0.833	0.830	0.649	0.806
	Cognitive status								
	r					− 0.060	− 0.082	− 0.070	0.030
	p					0.647	0.530	0.592	0.816
	Postoperative pain								
Men ($n=38$)	*r*	0.274	0.084	0.038	0.054	− 0.107	0.041	0.162	0.037
	p	0.096	0.616	0.819	0.747	0.522	0.809	0.332	0.824
	Kinesiophobia								
	r		− 0.071	− 0.214	− 0.134	− 0.115	0.093	0.278	− 0.057
	p		0.672	0.198	0.424	0.490	0.579	0.091	0.736
	Mobility								
	r			0.203	− 0.043	− 0.184	− 0.207	0.131	0.027
	p			0.222	0.798	0.269	0.213	0.432	0.871
	Functional level								
	r				− 0.034	0.028	− 0.030	− 0.160	0.009
	p				0.839	0.867	0.858	0.336	0.960
	Cognitive status								
	r					0.217	0.091	− 0.082	− 0.026
	p					0.190	0.586	0.626	0.878

*Spearman's rank correlation analysis

available for the assessment and rehabilitation of older adults after these operations [6, 23]. However, there are no standardized procedures during the evaluation and rehabilitation of older adults after other operations (abdominal or thoracic surgery, etc.) [6]. This study will contribute to the current literature by attracting interest in this field and increasing the evaluations performed. The present study is the first to investigate pain, mobility, functional level and kinesiophobia in older adults after general surgery.

Functional independence is the primary objective of rehabilitation programs in older adults, especially after discharge [6]. Although functional level measurements differ between studies, a decrease is known to occur in older adults after surgery [24, 25]. In this sense, according to Lawrence et al. [25] and Miller et al. [26], functional levels

Table 4 In the relationships between kinesiophobia, mobility, functional level and marital status, type of anesthesia, cognitive status in older women

Variables	*B*	Beta	*p*	R^2
Mobility				
Constant	3.558		0.437	0.253
Cognitive status	0.397	0.335	0.007	
Functional level				
Constant	113.425		0.001	0.167
Marital status	4.401	0.367	0.005	
Type of anesthesia	− 4.514	− 0.332	0.011	
Kinesiophobia				
Constant	63.218		0.001	0.185
Social security	− 8.700	− 0.413	0.005	

Stepwise multiple linear regression model

B regression coefficient constant term

in older adults were adversely affected in the postoperative period (abdominal surgery or gynecological surgery). The decreases in function and mobility levels following surgery in older adults in this study is consistent with the previous literature [25].

The evaluation of daily living activities in hospitalized older adults using the FIM is regarded as an important factor in their emerging from their hospital room and rejoining the community [27]. Good functional levels were determined among the individuals in the present study. In contrast to our results, Hershkovitz et al. [27] reported poor functional levels of individuals among individuals with an average FIM value of 100 or more, and those significant clinical changes may not be observed even after in-hospital rehabilitation. It was emphasized that activities of daily living should also be evaluated after discharge. Moreover, in the present study, regression analysis identified demographic factors, such as type of anesthesia and marital status as effective in predicting FIM values. FIM values are thought to be good in the presence of factors, such as general anesthesia and being married. In contrast to our results, Astur et al. [28] reported that postoperative anesthesia type had no effect on FIM values. The discrepancy may be due to the effect of the type of anesthesia because of the different drugs employed [28]. Although anesthesia has different effects on different individuals, functional levels may be adversely affected in local anesthesia due to the patient's awareness of surgery and subsequent memory of those moments [3, 6]. The psychological state of older adults is known to be one of the factors affecting functional state [3, 6]. In addition, mental impairment is expected to affect the functionality of older adults undergoing general anesthesia [29]. No relationship was observed in this study between mental status and type of anesthesia and functional level. Moreover, older adults had higher mental test scores than the general community in this study (Table 2). This may be attributed to a relationship between functional level and type of anesthesia resulting from different interactions of the drugs used in anesthesia and psychological factors or existing chronic diseases [24, 25, 28]. Further studies are now needed on this subject.

Marital status was identified as another factor predicting functional level in older women [30]. Previous studies have described marital status as one of the factors affecting discharge in the rehabilitation process in older women [29, 30]. This may be due to marriage representing a more stable life [31]. A constantly changing life has been reported to be capable of affecting mental state in the postoperative period in older adults [25, 31]. In addition, the fact that married older women have greater functionality than individuals living alone may suggest that their functional levels are already high in the preoperative period, and that pre-operative functionality may persist in the postoperative period [25].

Mental status is one of the parameters requiring particular evaluation after surgery in older adults case of a decrease in mental status is frequently seen in older adults after surgery [32]. Several factors, such as previous surgical history, drugs used before surgery, genetic structure, and the type of anesthesia employed may trigger a decrease in mental status [32]. A decreased mental status may, therefore, be expected to reduce mobility levels among older adults. Mobility is required for a wide range of activities, such as shopping, exercising, and doing household chores. Forgetfulness and confusion may emerge as mental status decrease, and daily living activities may also be restricted [33]. In the present study, mental status was identified as a predictive factor for mobility in women, and mobility increased in line with mental status. Previous studies have also reported a relationship between mental status and mobility [27, 32, 33]. However, the present research differs from previous studies in terms of such a relationship being observed only among women. Little information is available in the literature concerning the role of genders as an effective factor in mobility [27]. Regression analysis was applied to determine whether the female gender was a predictive factor. Healthcare professionals should, therefore, assess mental status when examining the mobility status of older adults after surgery or when planning rehabilitation programs after discharge. Lyons et al. [34] recommend that the mobility and mental status measurements of older adult inpatients be assessed as early as possible. No statistically significant difference between the two groups in terms of mental status in the present study. The relationship between mental status and mobility may, therefore, be attributed to older women having high numbers of chronic diseases and low education levels [33]. This possibility may be important for future studies. We think that is it important that education level and chronic illness status should not be overlooked, especially in older women.

Studies have reported that pain assessment alone is not sufficient in older adults after surgery [15, 33]. Age affects the level of pain experienced after major surgery, with older people being more likely to better tolerate postoperative pain. However, no decrease occurs in the pain-related impact on functional level, suggesting that older patients are in fact experiencing pain but not disclosing that fact. It has, therefore, been suggested that kinesiophobia measurements should be included with pain evaluation [15]. Pain and kinesiophobia values of older adults were measured in the present study. Pain levels capable of classification as moderate were determined and the kinesiophobia values were found higher than those reported by Ishak et al. [15] in this study. Another study reported kinesiophobia between 37 and 44 in older adults after disc herniation surgery [24]. The majority of studies of kinesiophobia have involved surgical operations to the lower extremity [24, 25]. In contrast to the previous literature, this study involved older adults undergoing general surgery (mostly abdominal surgery) [24, 25]. The high rate of kinesiophobia in this study may be attributed to fear of movement due to the trauma caused by the surgical intervention and the proximity of the surgical site to vital organs, such as the heart [6, 24, 25, 34].

Previous studies have reported that sociodemographic characteristics affect the discharge process and should be evaluated before discharge [1, 3, 6]. One important finding of the present study is the identification of social security as a predictive factor of kinesiophobia. The rate of kinesiophobia was higher in patients without social security. Social security status should, therefore, be examined when planning discharge or inpatient rehabilitation programs. At the same time, although not a predictive factor for kinesiophobia, age was also associated with fear of movement. According to Branström and Fahlström, kinesiophobia increases as age decreases [14]. As age increases, individuals may become unable to distinguish between pain and kinesiophobia. Older adults may, therefore, become accustomed to kinesiophobia because of greater experience of pain or pain-related beliefs [14]. This may be explained by older adults expecting pain and reduced activity (as a part of aging) and, therefore, employing different mechanisms for dealing with pain (such as taking medication or ignoring the pain).

The present study has several limitations, one of which is the type of surgery was not considered. However, this study was intended to emphasize that functional levels should be evaluated after all operations, not only specific procedures (hip fracture, cardiac, etc.). We recommend that the study now be repeated by investigating the type of surgery undergone by older adults hospitalized on the general surgery ward. Moreover, as we know that different diseases in the same organ, as well as the same procedure with different surgical approaches and the duration of surgery, are burdened by different morbidity and mortality rates [3]. The use of similar group numbers is recommended when investigating gender differences. However, nutritional status among older adults [6] balance [35], and the use of assistive devices were not investigated in this study [31, 33]. Previous research has shown balance and assistive devices affect functional levels in older adults [36, 37]. Emotional state analysis is also recommended in the postoperative period [6, 27]. We recommend that balance, emotion, and nutritional status be evaluated in future studies investigating functional level and mobility. Moreover, while using scales related to frailty in future studies, the literature can be enriched by giving more space to functional evaluations. In this study, differences were found between men and women in terms of demographic characteristics. However, it is recommended to observe the clinical effect of statistically significant results, and whether this difference is clinically important should be examined in future studies. Finally, we also recommend that kinesiophobia follow-up in older adults be performed 3 and 6 months after surgery in future such studies.

The present study, while analyzing the relationship between various factors, at the same time, it has been identified factors that should be evaluated in inpatient or discharge programs in the postoperative period in this study [14]. We conclude that the female gender, chronic disease status, and education level be considered when assessing mental state, pain, mobility, and functional level after surgery in older adults. Possession of social security emerged as a predictive factor for kinesiophobia in older women after surgery, while mental status was a predictive factor for mobility assessment. However, the type of anesthesia applied, and marital status emerged as predictive factors in functional level evaluations in women. Some of these factors may be usefully considered in the preparation of individually tailored interventions. These evaluations made individually for each older adult are important in terms of revealing the functional status of the older adults in the postoperative period [3]. Further investigation is now required concerning the role of postoperative function status, kinesiophobia, pain, and mobility in predicting short- and long-term rehabilitation after surgery.

Author contributions The study was conceived, organized and managed by AS, AAS, SM, HA was the guarantor and responsible for the execution of the study. Writing of the first draft of the paper was done by AS. All authors listed above were involved in preparation and critique of the manuscript.

Funding This study has no source of funding.

Availability of data and materials Not application (NA).

Code availability NA.

Declarations

Conflict of interest This study involves no conflict of interest.

Ethical approval Approval (no. P0128R00) was obtained from the Kırklareli University ethical committee, and written permission was received from the institution, where the survey was conducted.

Statement of human and animal rights All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

Consent to participate The informed consent form was received from the participants.

Consent for publication NA.

References

1. Sciumè L, Rebagliati GAA, Iannello P et al (2018) Rehabilitation after urgent or elective orthopedic surgery: the role of resilience in elderly patients. Rehabil Nurs 43:267–274
2. Usta E, Aygın D (2015) Why should postoperative care of elderly patients different be? J DU Health Sci Inst 5:59–65
3. Costa G, Bersigotti L, Massa G et al (2020) The emergency surgery frailty index (EmSFI): development and internal validation of a novel simple bedside risk score for elderly patients undergoing emergency surgery. Aging Clin Exp Res 33:2191–2201. https://doi.org/10.1007/s40520-020-01735-5
4. Berian JR, Mohanty S, Ko CY et al (2016) Association of loss of independence with readmission and death after discharge in older patients after surgical procedures. JAMA Surg 151:e161689
5. Oresanya LB, Lyons WL, Finlayson E (2014) Preoperative assessment of the older patient: a narrative review. JAMA 311:2110–2120
6. Brinson Z, Tang VL, Finlayson E (2016) Postoperative functional outcomes in older adults. Curr Surg Rep 4:21
7. McGregor AH, Doré CJ, Morris TP et al (2010) Function after spinal treatment, exercise, and rehabilitation (FASTER): improving the functional outcome of spinal surgery. BMC Musculoskelet Disord 11:17. https://doi.org/10.1186/1471-2474-11-17
8. Zanini M, Nery RM, de Lima JB et al (2019) Effects of different rehabilitation protocols in inpatient cardiac rehabilitation after coronary artery bypass graft surgery: a randomized clinical trial. J Cardiopulm Rehabil Prev 39:E19–E25
9. Battaglia G, Bellafiore M, Caramazza G et al (2014) Changes in spinal range of motion after a flexibility training program in elderly women. Clin Interv Aging 9:653–660
10. Scaturro D, Rizzo S, Sanfilippo V et al (2021) Effectiveness of rehabilitative intervention on pain, postural balance, and quality of life in women with multiple vertebral fragility fractures: a prospective cohort study. J Funct Morphol Kinesiol 6:24
11. Lin H, Watts NJ, Peel NM et al (2016) Frailty, and post-operative outcomes in older surgical patients: a systematic review. BMC Geriatr 16:157
12. Khalafallah AM, Huq S, Jimenez AE et al (2020) The 5-factor modified frailty index: an effective predictor of mortality in brain tumor patients. J Neurosurg 14:1–9
13. Wales K, Lannin NA, Clemson L et al (2018) Measuring functional ability in hospitalized older adults: a validation study. Disabil Rehabil 40:1972–1978
14. Bränström H, Fahlström M (2008) Kinesiophobia in patients with chronic musculoskeletal pain: differences between men and women. J Rehabil Med 40:375–380
15. Ishak NA, Zahari Z, Justine M (2017) Kinesiophobia, pain, muscle functions, and functional performances among older persons with low back pain. Pain Res Treat 2017:3489617
16. Demir-Akça AS, Saraçlı Ö, Emre U et al (2014) Relationship of cognitive functions with daily living activities, depression, anxiety, and clinical variables in hospitalized elderly patients. Noro Psikiyatr Ars 51:267–274
17. Aslan FE (2004) The sensivity and selectivity of the visual analog scale and verbal rating scale in the assessment of post-operative pain. Yoğun Bakım Hemşireliği Dergisi 8:1–6
18. Yağci N, Duymaz T, Cavlak U (2014) How does pain localization affect physical functioning, emotional status and independency in older adults with chronic musculoskeletal pain? J Phys Ther Sci 26:1189–1192
19. Güngen C, Ertan T, Eker E et al (2002) Reliability and validity of the standardized mini mental state examination in the diagnosis of mild dementia in Turkish population. Turk J Psychiatry 13:273–281
20. Akın B, Emiroğlu ON (2007) The validity and reliability of Turkish version of Rivermead Mobility Index (RMI) in the elderly. Turk Geriatri Derg 10:124–130
21. Yilmaz ÖT, Yakut Y, Uygur F et al (2011) Turkish version of the Tampa Scale for Kinesiophobia and its test-retest reliability. Fizyoter Rehabil 22:44–49
22. Kucukdeveci AA, Yavuzer G, Elhan AH et al (2001) Adaptation of the functional independence measure for use in Turkey. Clin Rehabil 15:311–319
23. Özmen T, Gafuroğlu Ü, Aa G et al (2017) Relationship between kinesiophobia, quadriceps muscle strength and quality of life in patients with knee osteoarthritis. Turk Geriatri Derg 20:38–45
24. Everink IHJ, van Haastregt JCM, van Hoof SJM et al (2016) Factors influencing home discharge after inpatient rehabilitation of older patients: a systematic review. BMC Geriatr 16:5
25. Miller KL, Richter HE, Graybill CS et al (2017) Fall risk and function in older women after gynecologic surgery. Arch Gerontol Geriatr 73:37–42
26. Lawrence VA, Hazuda HP, Cornell JE et al (2004) Functional independence after major abdominal surgery in the elderly. J Am Coll Surg 199:762–772
27. Hershkovitz A, Angel C, Brill NR (2018) The association between anticholinergic drug use and rehabilitation outcome in post-acute hip fractured patients: a retrospective cohort study. Drugs Aging 35:333–341
28. Astur DC, Aleluia V, Veronese C et al (2014) A prospective double blinded randomized study of anterior cruciate ligament reconstruction with hamstrings tendon and spinal anesthesia with or without femoral nerve block. Knee 21:911–915
29. Strøm C, Rasmussen LS, Sieber FE (2014) Should general anesthesia be avoided in the elderly? Anesthesia 69:35–44
30. Öztürk A, Tarsuslu ŞT, Tütün EY et al (2011) The relationship between physical, functional capacity and quality of life (QoL) among elderly people with a chronic disease. Arch Gerontol Geriatr 53:278–283
31. Alam A, Hana Z, Jin Z et al (2018) Surgery, neuroinflammation and cognitive impairment. EBioMedicine 37:547–556

32. Tütün YE, Tarsuslu ST, Sertel M et al (2011) The effect of functional mobility and balance on health-related quality of life (HRQoL) among elderly people living at home and those living in nursing home. Arch Gerontol Geriatr 52:180–184
33. Radinovic K, Milan Z, Denic LM et al (2014) Predictors of severe pain in the immediate postoperative period in elderly patients following hip fracture surgery. Injury 45:1246–1250
34. Lyons A, Romero-Ortuno R, Hartley P (2019) Functional mobility trajectories of hospitalized older adults admitted to acute geriatric wards: a retrospective observational study in an English university hospital. Geriatr Gerontol Int 19:305–310
35. Battaglia G, Giustino V, Messina G et al (2020) Walking in natural environments as geriatrician's recommendation for fall prevention: preliminary outcomes from the "passiata day" model. Sustainability 12:2684
36. Hanney WJ, Kolber MJ, Pabian P et al (2013) Accelerated rehabilitation after minimally invasive knee arthroplasty. Top Geriatr Rehabil 29:35–45
37. Sertel M, Şimşek TT, Yümin ET (2016) Investigation of the relationship between cognitive status, depression level, and balance in elderly. JETR 3:90–95