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Original Article

Frailty and Its Associated Factors among Hospitalized Older Patients in an Academic Hospital Using the FRAIL Scale

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SUMMARY

Background: This study aimed to investigate the prevalence of frailty and its associated factors among older patients (≥ 65 years) admitted to the hospital through the emergency room.
Methods: This was a cross-sectional analytical study. The sample comprised 367 patients (≥ 65 years) admitted to various wards in King Saud University Medical City (KSUMC) between November 2020 and February 2021. The study adopted the FRAIL scale consisting of five domains (fatigue, resistance, ambulation, illness, and loss of weight).
Results: The study showed that the prevalence rates of pre-frailty and frailty were 41.1%, and 51.8% respectively. In addition, there were significant differences between robust health, pre-frail, and frail older patients regarding age (p = 0.027), weight (p = 0.030), gender (p = 0.002), monthly income (p = 0.000), educational qualification (p = 0.001), history of medication (p = 0.024), and polypharmacy (p = 0.001). The results of the multivariate logistic regression revealed that older patients' age was a significant predictor of frailty among hospitalized old patients in KSUMC (p = 0.001).
Conclusion: The study concluded that there was a high prevalence rate of frailty among older patients (≥ 65 years) hospitalized in KSUMC. In addition, age was significantly associated with frailty among older patients. Further studies are needed to explore the impact on mortality and morbidity for frail patients admitted in various medical wards.

1. Introduction

Frailty is a condition that affects older people and develops due to age-accelerated decline in many organ systems in the body,[1] which collectively results in complications in resolving homeostasis following a stressor event, which means that frail older people face the risk of major changes in health following relatively illnesses.[2] For example, a frail older person who develops a relatively minor infection such as a chest infection or ear infection, becomes vulnerable to a sudden and disproportionate change in their health that often results in transition from being independent to dependent, from lucid to delirious, or from being mobile to either being immobile or falling.[3]

There are two principal models of frailty: the phenotype model and the cumulative deficit model.[4] Both models have been validated by large epidemiological studies, and both lack reliability for the identifying frailty.[5] Measuring frailty in a group of people using both models seems to identify many of the same people, which supports recognizing frailty as a unified construct.[4] The phenotype model was used to measure frailty among older hospitalized patients recruited in this study since it is more comprehensive and includes five criteria (weight loss, exhaustion, low physical activity, slowness and weakness).

Based on the phenotype model, frailty was introduced to capture heterogeneity in aging.[6] Based on the cumulative deficit model, frailty is caused by cumulative decline across multiple physiological systems; due to this decline, people with higher levels of frailty are vulnerable to multiple stressors (physiological, psychological, and environmental factors).[7] Frailty regards a continuum with extreme fitness on one side and extreme frailty on the other. As people grow older, they progress across this continuum;[8] however, it is important to ensure that frailty is reversible. There are two main views of frailty: the syndromic approach that views frailty as the frailty phenotype, another one is the deficit accumulation approach.[9]

Based on the deficit accumulation approach, frailty can be operationalized by creating a frailty index, which focuses on the number rather than the nature of people's health issues.[10] The variables included in a frailty index are rarely pre-specified, and some criteria determine how to screen these variables; however, at least 30 variables typically need to be included in a frailty index.[11]

Research on frailty has increased over the past years, especially since the early 2000s.[12] The association of the frailty index with various outcomes typically shows that the higher a person's frailty level, the more likely they are to experience adverse outcomes.[13] The most commonly examined outcome is mortality. The results of meta-analysis study by Kojima et al.,[9] showed that the pooled hazard ratio for the frailty index was 1.04, which means that every .01 increase in the frailty index results in a 4% mortality risk increase.

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Frailty indices are also useful for clinical care. Studies show different levels of recovery when comparing between frail and non-frail older patients experiencing particular stressors, such as a urinary tract infection. Non-frail patients would experience a small decline in function and then quickly recover back to their baseline state;[14] in contrast, a frail older patients experience a greater reduction in their function and a slower recovery, and they may never revert to their baseline state.

Various studies measured the prevalence of frailty among older people, one found a 78% prevalence rate of frailty syndrome. In addition, the study revealed that 28% had frank frailty, and 51% were classified in the pre-frail category.[15] Another study by Richards et al. reported that the prevalence rate of frailty among adult patients in New Zealand was 48.8%. and they found a significant association between the frailty prevalence rate and the participants' age.[16] A recent study reported that the rate of frailty among older people in Belgium was inversely correlated with dementia, polypharmacy and receiving care in nursing homes.[17] In Saudi Arabia, there is a lack of studies investigating the prevalence frailty syndrome or its associated factors, therefore, it would be significant to provide data about the prevalence of frailty and its predictors among older people in Saudi Arabia. The current study sought to determine the prevalence rate of frailty and its associated factors among older patients (age ≥ 65) hospitalized in King Saud University Medical City (KSUMC).

2. Materials and methods

2.1. Design and setting

The present work regards a cross-sectional study analyzing the responses of the participants at one time-point to determine the prevalence of frailty among older Saudi patients hospitalized in KSUMC. The study population included older patients hospitalized in KSUMC between November 2020 and February 2021.

2.2. Participants

The study sample comprised 367 participants (age ≥ 65 years and above). Using a confidence interval of 95%, margin of error of 5%, and a significance level of 0.05, the participants represented various sociodemographic and clinical characteristics to accurately represent the study population. The sampling procedure included randomly selecting participants from the target population and assigning them numbers.

The inclusion criteria included patients aged 65 years or more who were hospitalized in KSUMC. The exclusion criteria included severe cognitive impairment patients, which was determined by the inability to follow two-step commands or to understand the informed consent process. Patients with an unstable medical condition that affected participation were excluded as well, along with patients who were receiving palliative care.

The study was approved by the Institutional Review Board of King Saud University (Ref. No. 20/0267/IRB, 21.04.2020). In addition, the participants provided written consent to ensure their voluntary participation in the survey. The researchers ensured the privacy and confidentiality of the participants' responses and their personal data, and they confirmed that these data will be maintained confidentially during and after the study.

2.3. Instrument

The study adopted data collection excel sheets consisting of two parts, beginning with the demographics and covariates. The covariates used in the present study included participants' age, weight, height, BMI, gender (male, female), marital status (single, married, divorced, widowed), monthly income, educational qualification (no formal education, primary, intermediate, secondary, and university), history of falls, history of medication (used previous medications or not) and polypharmacy (more than 5 medications).

The second part was the FRAIL scale which consists of five domains (fatigue, resistance, ambulation, illness, and loss of weight).[18] Fatigue component examines the amount of feeling fatigue during the past four weeks; resistance component examines any difficulties in walking up to 10 steps without resting or using any assistant tools; ambulation component examines any difficulties encountered when walking for a few hundred meters; the illness component explores the type of the medical condition of the patient; and the loss of weight component that examines the percentage of change in the patients' weight through a one-year time period. Frail scale scores range from 0–5 and represent a frail (3–5), pre-frail (1–2), and robust (0) health status.[18] A bilingual version (Arabic and English) of the study scale were used to interview the study participants. The Arabic version (Arabic and English) of the FRAIL scale was used to interview the participants. The Arabic version was validated concerning reliability in the Saudi context by Al Qahtani and Nasser.[19] The internal consistency coefficient was 0.786.

2.4. Data collection procedure

The researchers prepared the data collection using a package that included the consent form and data collection excel sheet. A group of four trained research staff interviewed the older hospitalized patients (≥ 65 years). The participants were asked to read the instruction page and sign the consent form if they accept participation in the study. The data collection process was performed in the various departments and wards of KSUMC between November 2020 and February 2021. Due to the COVID-19 pandemic, the researcher ensured adherence to the precautionary measures for the safety of the researcher and participating patients.

2.5. Statistical analysis

To analyze the gathered data, the study used the Statistical Package of Social Sciences (SPSS, v. 26.0, IBM Corporation). Descriptive statistics such as means, standard deviations, frequencies and percentages were used to analyze the participants' demographic characteristics and responses to the study scales. In addition, multiple linear regression analysis was performed to determine the frailty-associated factors among the study participants. A p value < 0.05 was considered to be statistically significant.

3. Results

3.1. Demographic characteristics of the study participants

The results presented in Table 1 represent the characteristics of the study participants (n = 367). The study participants had a mean age of (73.73 ± 7.11) years, mean weight of (74.93 ± 19.16) and mean height of (159.7 ± 11.7). In addition, half of participants were male 52.9% (n = 194) and married patients were the highest represented category at 82.6% (n = 303).

Most surveyed patients (n = 301, 82%) had a monthly income lower than 5000 SAR. Furthermore, 71.1% (n = 261) had no formal education, 11.4% (n = 42) had university-level education, and 10.9%

Table 1
Characteristics of the study participants.

Variable	n (%)	Mean ± SD	Robust	Pre-frail	Frail	p value
Age (years)		73.73 ± 7.11	69.6 ± 5.5	72.2 ± 6.1	75.5 ± 7.6	0.027
Weight (kg)		74.93 ± 19.16	73.8 ± 12.3	75.0 ± 17.7	75.0 ± 21.0	0.030
Height (cm)		159.7 ± 11.7	162.8 ± 9.1	160.6 ± 11.3	158.5 ± 12.3	0.200
BMI		28.8 ± 6.8	28.0 ± 5.4	28.5 ± 5.9	29.1 ± 7.7	0.873
Length of stay (days)		13.7 ± 95.4	6.2 ± 17.6	11.8 ± 81.1	16.2 ± 111.1	0.597
Gender						0.002
Male	194 (52.9%)		19 (73.1)	90 (59.6)	85 (44.7)	
Female	173 (47.1%)		7 (26.9)	61 (40.4)	105 (55.3)	
Marital status						0.455
Single	6 (1.6%)		0 (0)	3 (2)	3 (1.6)	
Married	303 (82.6%)		23 (88.5)	127 (84.1)	153 (80.5)	
Divorced	5 (1.4%)		0 (0)	0 (0)	5 (2.6)	
Widowed	53 (14.4%)		3 (11.5)	21 (13.9)	29 (15.3)	
Monthly income (SAR)						0.001
Less than 5,000	301 (82%)		16 (61.5)	112 (74.2)	173 (91.1)	
5,000–10,000	37 (10.1%)		5 (19.2)	21 (13.9)	11 (5.8)	
10,000–15,000	23 (6.3%)		5 (19.2)	14 (9.3)	4 (2.1)	
More than 15,000	6 (1.6%)		0 (0)	4 (2.6)	2 (1.1)	
Educational qualification						0.001
No formal education	261 (71.1%)		9 (34.6)	94 (62.3)	158 (83.2)	
Primary	18 (4.9%)		0 (0)	8 (5.3)	10 (5.3)	
Intermediate	6 (1.6%)		0 (0)	4 (2.6)	2 (1.1)	
Secondary	40 (10.9%)		8 (30.8)	20 (13.2)	12 (6.3)	
University	42 (11.4%)		9 (34.6)	25 (16.6)	8 (4.2)	
Living status						0.280
Alone	11 (3.0%)		2 (7.7)	5 (3.3)	4 (2.1)	
With someone	356 (97%)		24 (92.3)	146 (98)	186 (97.9)	
History of falls over last 12 months?						0.252
No falls	231 (62.9%)		19 (73.1)	112 (74.2)	100 (52.6)	
Less than 5 falls	121 (33%)		4 (15.4)	36 (23.8)	78 (41.1)	
5–10 falls	14 (3.8%)		3 (11.5)	3 (2)	11 (5.8)	
More than 10 falls	1 (0.3%)		0 (0)		1 (0.5)	
History of medication						0.024
Yes	361 (98.4%)		24 (92.3)	148 (98)	189 (99.5)	
No	6 (1.6%)		2 (7.7)	3 (2)	1 (0.5)	
Is it more than 5 medications (polypharmacy)						0.001
Yes	278 (75.7%)		13 (50)	106 (70.2)	159 (83.7)	
No	89 (24.3%)		13 (50)	45 (29.8)	31 (16.3)	

(n = 40) had secondary education. Primary and intermediate educational levels were represented by 4.9% (n = 18) and 1.6% (n = 6), respectively. Finally, a high majority of the surveyed patients lived with someone (97%, n = 356), whereas those who lived alone represented 3% (n = 11).

Regarding the number of falls among the study participants, 62.9% (n = 231) had no falls, 33% (n = 121) had fallen less than 5 times, and 0.3% (n = 1) had fallen more than 10 times. The results concerning the history of medications revealed that most patients (98.4%, n = 361) are taking medication, whereas only six participants (1.6%) had no history of medications, with 75.7% (n = 278) having more than 5 medications and 24.3% (n = 89) having less than 5 medications.

The results in Figure 1 represent the prevalence rate of the frailty among the surveyed patients, which shows that 7.1% (n = 26) had a robust health status; pre-failty was prevalent among 41.1% (n = 151); and finally frailty was prevalent among 51.8% (n = 190) of the total sample.

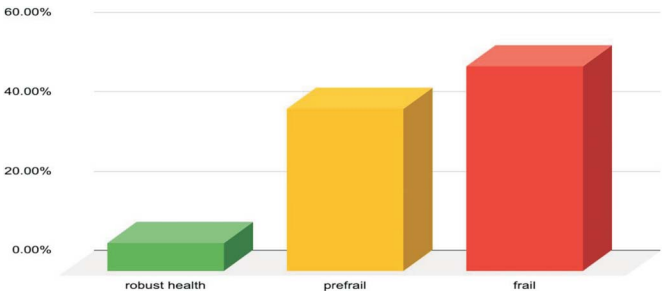

Figure 1. Prevalence of frailty, pre-frailty, and robust health status among the study patients (n = 367).

3.2. Predictors of frailty among the study participants

The results shown in Table 2 represent the multivariate regression analysis summary of the variables predicting frailty, including age, weight, income, gender, educational qualification, history of medication, and polypharmacy. The results revealed that age is a significant predictor of frailty (F(39,1) = 19.077, p = 0.001), while weight, income, gender, educational qualification, history of medication, and polypharmacy were found to be non-significant predictors of frailty among older patients.

4. Discussion

The present study sought to investigate the prevalence of frailty and its associated factors among older patients (≥ 65 years) hospitalized in KSUMC. The findings revealed that frailty is prevalent among

Table 2
Multivariate regression analysis model for variables predicting frailty.

Source	Type III sum of squares	df	Mean square	F	Sig.
Corrected model	40.607[a]	39	1.041	3.334	.001
Intercept	.124	1	.124	.398	.528
Age	5.957	1	5.957	19.077	.001
Weight	.048	1	.048	.153	.696
Income	1.080	3	.360	1.153	.328
Gender	.270	1	.270	.865	.353
Educational qualification	.938	4	.235	.751	.558
History of medication	.293	1	.293	.940	.333
Polypharmacy	.258	1	.258	.825	.364

51.8% (n = 190) of the older patients hospitalized in KSUMC, and they revealed that age is a significant predictor of frailty among the older patients recruited in this study.

The results showed that the most of patients were married and had no formal education, which could be caused by the nature of the age group investigated. Early marriage is a trait of the Saudi community along with a lack of formal education during these patient youth, which could have increased the percentage of married patients or those lacking formal education. Developments in education have occurred in recent decades, including the compulsory education for all citizens.

In addition, a high proportion of patients had low income, which could be because most of older people in Saudi Arabia receive social security payments within the income range of this study (less than 5,000 SAR). Moreover, the results showed that a high proportion of older patients did not experience falls or experienced fewer than five falls. This result might be explained by the social support provided by family members in the patient's home, because the social norm in Saudi families requires attention and care for the elderly.

The results revealed that a high majority of the patients had a history of medications, which might be due to the difference in the medical conditions and due to hospitalization in different wards and departments. Most of the patients had chronic diseases that require adhering to a specific medication regimen; therefore, the majority had a medication history for more than five medications.

Investigating the frailty prevalence revealed that more than half of the patients were classified as frail and about 41% as pre-frail. These results are consistent with the findings reported by Alqahtani et al.,[20] who found that the prevalence rate of pre-frailty among older Saudi patients was 47.3%, but they were inconsistent regarding the prevalence of frailty, which was 21.4%. This result might be attributed to the presence of different medical conditions among hospitalized older patients and their high length of stay. In addition, this result might be attributed to the lack of formal education among the older patients, because this lack of knowledge negatively affects the patients' medical condition and requires them to seek help from healthcare workers or family members.[22]

The results showed that age was predictor of frailty, which could be due to the progressed medical condition with age, especially since the mean age of the participants was high. This is evidenced by the results of Chen et al. and Alqahtani et al., who reported that pre-frailty and frailty are associated with increasing age.[20,21]

In addition, gender, educational qualification and monthly income were not found to be associated with frailty among older patients. However, gender-difference was reported in some studies that females were more susceptible to frailty compared to male patients, which could relate to the difference in body's physiological composition. Furthermore, education and income findings in our study are contradictory to the results reported by Hoogendijk et al., which indicated that older people with lower educational levels tend to have higher rates of frailty, while in another study, educational level and economic status were predictors of frailty among older people.[22,23] In general, the effect of gender and other epidemiological factors on the pathogenesis of frailty should be investigated and strategies for prevention and management of frailty to completely consider these factors as fundamental components.

Despite the lack of local research in this field, our study, up to our knowledge, is the first study to consider screening for frailty among older patients who are hospitalized in Saudi hospitals. However, there are a number of limitations of the present study to consider. The results might not be generalizable because of limited number of included participants in single tertiary hospital in Saudi Arabia. In addition, several variables that affect the prevalence of frailty were not explored because of limited resources of the research team and covid-19 precautions prevented us from assessing physical function of the participants. Additional cross-sectional and analytical studies are thus needed to provide a more reliable research-based evidence regarding the prevalence of frailty and its associated factors among hospitalized patients in various Saudi hospitals.

5. Conclusion

The present study highlighted the elevated prevalence rates of frailty and pre-frailty among hospitalized patients in a large tertiary academic hospital in Saudi Arabia. This study found that frailty is significantly associated with age. However, gender, economic status, educational level and falls history were not significantly associated with frailty. The recommendation is to conduct further studies to assess the prevalence rate of frailty among Saudi population and to hold awareness campaigns to increase the public awareness of frailty.

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Declaration of competing interest

The authors declare that there is no conflict of interest.

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