Original article

Frailty, sarcopenia and health related outcomes among elderly patients in Saudi Arabia

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ABSTRACT

Objective: To determine the prevalence of frailty and sarcopenia among elderly patients in Saudi Arabia and explore if there are significant association between frailty and sarcopenia.
Methods: A total of 498 patients from public tertiary hospital in Saudi Arabia participated in this descriptive cross-sectional study between March 2019 to June 2019. All participants answered a 5-part questionnaire, which includes demographic data, Edmonton Frail Scale, SARC-F and questions related to Activities of Daily living.
Results: The mean age of the participants was 69.98 ± 6.28. Of the 498 participants, 67.7% were aged 61–70 years and 42% had a BMI of greater than < 30 kg/m^2. The prevalence of patients with mild frail, moderate frail and severely frail were 22, 12, and 4%, respectively. The analysis showed that majority of patients who had sarcopenia were females (84%). The analysis show that the level of frailty of patients were significantly different between age, marital status, educational level and patients' needs of home care, activities of daily living, presence of comorbidity and sarcopenia (p = 0.001). In the logistic regression analysis, the pre-frailty group was significantly likely to have sarcopenia (OR 0.02 95% 0.01–0.23p = 0.001) than nonfrailty patients.
Conclusion: In conclusion, this research highlights the high prevalence of sarcopenia among elderly patients and the increasing percentage of frail patients in Saudi Arabia. In addition, significant difference and association were found with sarcopenia and frailty with many sociodemographic and clinical components of elderly patients in Saudi Arabia.
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1. Introduction

Frailty is a clinical syndrome associated with aging characterized by loss of physiologic and cognitive reserves (Clegg 2013). It is also associated with poorer health related quality of life and increases vulnerability to adverse outcomes such as functional decline, unplanned hospitalizations, surgery, and mortality (Clegg, 2013; Shimada, 2013; Pel-Little, 2009). Even though frailty is associated with age or its prevalence, it not similar or synonym with aging and different from the definition of "healthy aging" (Sacha, 2017; Xue, 2008). The assessment of frailty or identifying frail individual is emerging as a critical issue because it may help clinicians to recognized high-risk patients of procedural complications, disability, institutionalization and death (Sacha, 2017; Xue, 2008; Boyle, 2010; Chen, 2014).

Several tools have been developed and the most often frailty assessments are the Edmonton Frailty Scale, Frailty Phenotype (FP) and Frailty Index (FI) (Rolfson, 2006; Pereira, 2017; Clegg, 2016). These tools are extensively published on for the assessment of frailty. Frailty phenotype instruments measures and assess motor and activity that predominate and lead to an aggregate score that spans from robust to frail (Rolfson 2006). Meanwhile, frailty index instruments, assess factors like social, psychological conditions, co-morbidities and cognitive decline (Pereira, 2017; Clegg,

2016). Several frailty instruments are suitable for identifying patients or individuals at high risk for adverse outcomes and for risk division to assist in clinical decision making (Walston 2018).

The prevalence of frailty in general and specific population has been reported by previous studies in Saudi Arabia, however, associated factors in frail individuals such as sarcopenia and other factors remains unknown. Sarcopenia is a condition in which presence of low skeletal muscle mass plus and strength with poor physical disability (Santili 2014). Because of the similarities in etiology and definition which can be present in the same patient, the occurrence of both condition may have implication and consequence for treatment and outcome of elderly patients. Identifying the prevalence of frailty and may likely to take advantage of preventive actions in these certain population. Thus, we aim to answer the following question: first, what is the prevalence of frailty and sarcopenia among elderly patients in Saudi Arabia? Second, is there are significant difference between baseline characteristics of elderly patients and other factors with frailty and sarcopenia and lastly, to determine association of level of frailty in elderly patients with sarcopenia.

2. Methods

2.1. Design and setting

A descriptive cross-sectional study will be performed in one of the largest tertiary-level hospital in Saudi Arabia from March 2019 to June 2019. The selected hospital is a multi-disciplinary facility and referral hospital in Riyadh, Saudi Arabia which is facilitated by Ministry of Health. Ethical approval from the Institutional Board of the selected hospital will be sought prior to distribution of survey questionnaire.

2.2. Participants

For this study, all patients attending outpatients' clinics in a public tertiary hospital, aged 50 and above, Saudi national and able to walk independently were included in the study. Physically impaired or has sensory impairment and patients with existing comorbidities such as stroke, dementia and Parkinson's disease as well as incomplete data on frailty were excluded from this study. The caregiver of the patients will also be invited to participate and answer in behalf of the patients. Calculating a sample size for estimating prevalence of both frailty and sarcopenia in a group of elderly patients:

P Frailty = 0.27
Alpha level = 0.05 (corresponding to 95% confidence level)
Power = 0.8
Margin of error (m) = 0.05
$N = Z a$
$2 [p(1-p)] / m 2$
$N = 1.96 2 [0.27*0.73] / (0.05) 2 = 302 \approx 303$
P sarcopenia = 0.443
Alpha level = 0.05 (corresponding to 95% confidence level)
Power = 0.8
m = 0.05
$N = 1.96 2 [0.443*0.557] / (0.05) 2 = 379.1 \approx 380$

We expect the response rate will be 80%, then we adjust the sample size to count for this assumed response rate: N adjusted = N / response rate.

2.3. Instrument

All consented participants answered a self-administered questionnaire that compose of sociodemographic questions, questions related to activities of daily living and Edmonton Frail scale, Basic demographic information includes age, sex, marital status, educational level and BMIs.

Frailty will be measured using the Edmonton frailty scale (EFS), a validated tool will be scored the patients level of frailty from 0 to 17 (not frail to very frail) [8]. The degree of frailty will determine from the following cutoff; 0–5 = not frail, 6–7 = vulnerable; 8–9 = mild; 10–11 = moderate; and 12–17 = severely frail. The EFS tool assess 9 domains related to frailty such as general health status, cognition, social support, functional dependence, continence, mood, nutrition and medical use (Rolfson 2006).

The SARC-F questionnaire was developed as a rapid diagnostic tool for sarcopenia. Five components closely related to functional status were self-reported by the older individuals: strength, assistance with walking, rising from a chair, climbing stairs, and falls, which were scored between 0 and 2, with higher scores being suggestive of sarcopenia. The score ranged from 0 to 10 (Yang 2018).

The Katz Activities of Daily Living (ADL) scale is an instrument that developed to assesses six primary and psychosocial functions: bathing, dressing, going to toilet, transferring, feeding, and continence (Ibrahim 2018). Katz and collaborators found that these six activities have a hierarchical order in which the most complex functions are lost first. Each ADL is scored on a 3-point scale of independence. Items are ordered by difficulty. The scoring reflects this, although some variation in the hierarchy of difficulty is allowed with a score range of 0–6.

The Lawton IADL scale can be scored in several ways, the most common method is to rate each item either dichotomously (0 = less able, 1 = more-able) or (1 = unable, 2 = needs assistance, 3 = independent) and sum the eight responses (Potkin, 2002). The higher the score, the greater the person's abilities. Women are scored on all 8 areas of function, but, for men, the areas of food preparation, housekeeping, laundering are excluded. Clients are scored according to their highest level of functioning in that category. A summary score ranges from 0 (low function, dependent) to 8 (high function, independent) for women, and 0 through 5 for men.

The Charlson Comorbidity Index (CCI) was originally developed to predict 1-year mortality in a mixed population of internal medicine patients using comorbidity derived from chart review. The CCI consists of 19 selected conditions that are weighted and summed to an index on a 0–33 scale. Patients were divided into three groups: mild, with CCI scores of 1–2; moderate, with CCI scores of 3–4; and severe, with CCI scores ≥ 5. CCI was calculated according to the scoring system established by Charlson et al (D'Hoore 1996).

2.4. Data collection procedure

All patients attending from ambulatory clinics in a public tertiary hospital in Riyadh Saudi Arabia were interviewed by two researchers. The researchers asked and seek approval to patients' physician to set a time to interact with the participants for facilitating the data collection. Written consent was sought prior to data collection in accordance with the guidelines of Institutional Review Board of King Saud Medical City. The researchers ensured the patients about their confidentiality and their participation were voluntary.

2.5. Statistical analysis

All data were entered and analyzed using SPSS 23 (Chicago, IL, USA). Patient characteristics were summarized using descriptive statistics. Shapiro-Wilk (S-W) test was used to determine the normal distribution of variables. Means and standard deviation were used to present the results of normally distributed variables while median with interquartile range was used for non-normal dis-

tributed variables. The Chi-square test was applied to detect differences between demographic characteristics and level of frailty. Logistic regression analysis was performed to determine the association between level of frailty and sarcopenia. A $p < 0.05$ level was considered statistical significant.

3. Results

3.1. Demographic characteristic of the participants

The study participants included 498 patients admitted in a referral hospital in Riyadh, Saudi Arabia. The characteristics of the participants were shown in Table 1. The mean age of the participants was 69.98 ± 6.28. Of the 498 participants, 67.7% were aged 61–70 years and 42% had a BMI of greater than <30 kg/m². >70% of the participants were females and nearly half of the participants had no formal education (N = 212, 42.6%). Twenty-five per-

Table 1
Demographic characteristic of the participants.

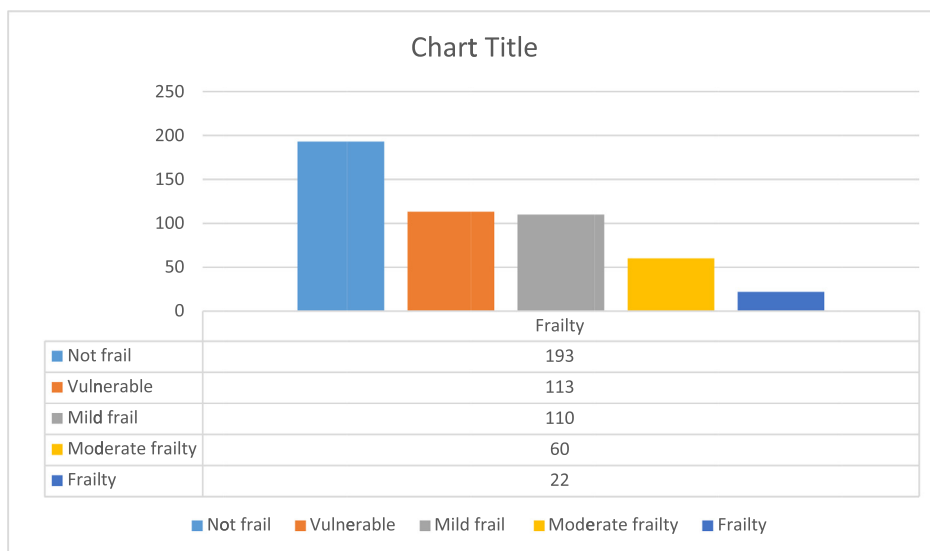| Variable	N = 498	%
Age	Mean 69.98 SD 6.28	
51–60 years	3	0.6
61–70 years	337	67.7
70 and above	158	31.7
BMI		
>30 kg/m²	194	53.6
<30 kg/m²	152	42.0
Gender		
Male	136	27.3
Female	362	72.7
Marital status		
Single	151	30.3
Married	347	69.7
Educational level		
No formal education	212	42.6
Primary	126	25.3
Intermediate	42	8.4
Secondary	58	11.6
High education degree	60	12.0
Do you need home care		
Yes	372	74.7
No	126	25.3

cent had primary level of education and 12% of the participants had high education degree. The majority of the patients reported that they need home care (N = 372, 74.7%). The prevalence of frailty for the total sample is presented in Fig. 1. The prevalence of patients with mild frail, moderate frail and severely frail were 22, 12, and 4%, respectively. According to the frail scale, 22% was vulnerable and 38% of the participants were not frail. Fig. 2 shows the percentage of sarcopenic and nonsarcopenic patients according to gender.

Table 2 shows the comparison of certain clinical and demographic characteristics between the level of frailty of patients. There were 22 (4.4%) patients in the frailty group, 283 (56.8%) patients in the prefrailty group and 193 (38.7%) patients in the nonfrailty group. The analysis show that the level of frailty of patients were significantly different between age, marital status, educational level and patients' needs of home care, activities of daily living, presence of comorbidity and sarcopenia ($p = 0.001$).

Logistic regression analysis was performed to assess the association of level of frailty and sarcopenia. As shown in Table 3, the pre-frailty group was significantly likely to have sarcopenia (OR 0.02 95% 0.01–0.23 $P = 0.001$). The odds ratio of 0.02 was<1, which indicated that for every prefrailty patients there were 0.02 times less likely to have sarcopenia.

4. Discussion

This study highlights the increasing prevalence of sarcopenia whereas 84% of sarcopenic were females. This is contrary to a study done in Western Europe in which prevalence of sarcopenia was 12.5% among subjects aged 80 years and over (Buckinx 2017). In another study in Europe, the prevalence of sarcopenia, among patients aged 65 years or more was. 13.7% (Martone 2017). The findings in the present study shows that the prevalence of sarcopenia is about 3 times higher compared with other countries that was approximately 10 to 15%. The high prevalence can be explained by the particular care setting of the study population which was home setting. Previous study admitted that the prevalence of sarcopenia increases and associated with the place of care of patients (Moreira, 2019; Landi, 2012). There is a strong association of the degree of sarcopenia with dependence among residents (Bauer 2008). One multi-centered study in Spain show 37% prevalence sarcopenia and comparable in the present study (Bravo-Jose

	Frailty
■ Not frail	193
■ Vulnerable	113
■ Mild frail	110
■ Moderate frailty	60
■ Frailty	22

■ Not frail ■ Vulnerable ■ Mild frail ■ Moderate frailty ■ Frailty

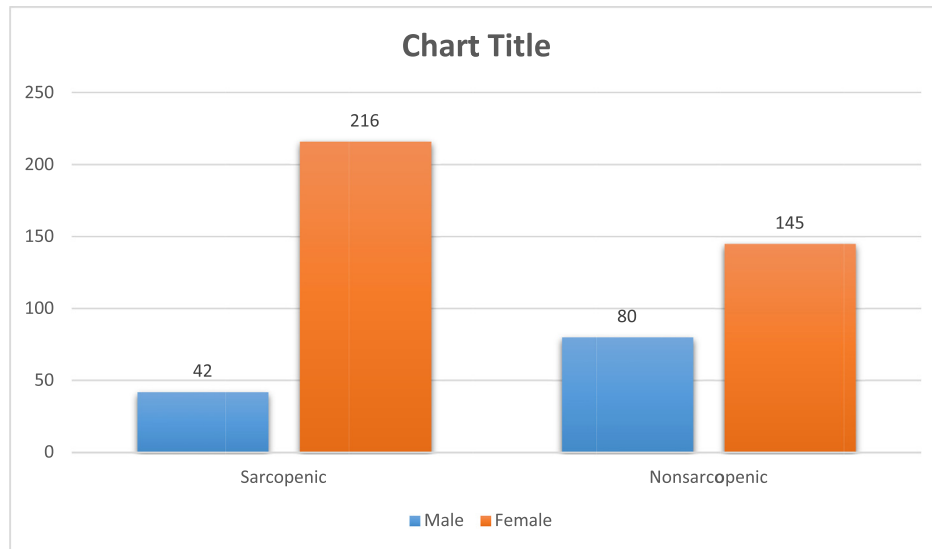**Fig. 1.** Prevalence of Frailty among elderly patients in Saudi Arabia.

Fig. 2. Sarcopenic vs nonsarcopenic patients according to gender.

Table 2
Difference regarding patients' demographic characteristic with level of frailty.

Variable	Total N = 498	Nonfrail (N = 193)	Pre Frail (N = 283)	Frail (N = 22)	P value
Age					
70 and below	340 (68.3)	148 (43.0)	183 (54.3)	9 (2.7)	**0.001**
71 and above	158 (31.7)	45 (28.5)	100 (63.3)	13 (8.2)	
BMI [kg/m²]					
BMI > 30 kg/m²	28.34 (21.78)	57 (32.2)	112 (63.3)	8 (4.5)	0.074
Gender					
Male	136 (27.3)	64 (47.1)	66 (48.5)	6 (4.4)	0.061
Female	362 (72.7)	129 (35.6)	217 (59.9)	16 (4.4)	
Marital status					
Single	151 (30.3)	38 (25.2)	74 (49.0)	6 (4.0)	**0.001**
Married	347 (69.7)	155 (44.7)	96 (27.7)	16 (4.6)	
Educational level					
No formal education	212 (42.6)	69 (32.5)	132 (62.3)	11 (5.2)	**0.002**
Primary	126 (25.3)	38 (30.2)	82 (65.1)	6 (4.8)	
Intermediate	42 (8.45)	17 (40.5)	24 (57.1)	1 (2.4)	
Secondary	58 (11.6)	35 (60.3)	20 (34.5)	3 (5.2)	
High education degree	60 (12.0)	34 (56.7)	25 (41.7)	1 (1.7)	
Do you need home care					
Yes	372 (74.5)	109 (29.3)	242 (65.1)	21 (5.6)	**0.001**
Activity of daily living: Katz index					
<2 patient very dependent	64 (12.8)	3 (4.7)	49 (76.6)	12 (18.8)	**0.001**
Activity of daily living: Lawton Brody (less able)					
Male	8	0	4 (50)	4 (50)	**0.001**
Female	36	2 (5.6)	27 (75.0)	7 (19.4)	
Charlson Comorbidity Index					
Severe	83 (22.9)	15 (12.7)	94 (79.7)	9 (7.6)	**0.001**
Sarcopenia					
Sarcopenic	258	53 (20.5)	186 (72.1)	19 (7.4)	**0.001**

Note: Chi-square analysis was used in this table; p-value significant at p < 0.05

Table 3
Relationship between the level of frailty and sarcopenia.

Frailty level	Sarcopenia		
	OR	(95% CI)	P-value
Nonfrailty	1(Reference)		
Prefrailty	0.02	0.01–0.23	**0.001**
Frailty	0.23	0.02–2.08	0.192

Note: p-value significant at p < 0.05.

2018). In addition, in Turky, the prevalence of sarcopenia was identified at a percentage rate of 29%, while 40% of prevalence among Australian patients (Senior 2015).

Another highlight of the study is the prevalence of frailty in Saudi population. The results highlight that among the prevalence of patients with mild frail, moderate frail and severely frail were 22, 12, and 4%, respectively. This suggests that frail patients are more at risk of being sarcopenic and it confirms the hypothesis that sarcopenia is a major factor in the development of frailty (Yalcin 2016). We found that the prevalence of sarcopenia increased when

getting older; however, the prevalence of sarcopenia often high in the subjects >80 years of age in previous study (Rolland, 2008; Dennison, 2017).

In this study, we showed that there were significant association between level of frailty and sarcopenia. Our results indicate that presence of sarcopenia is associated with early stage of frailty. Previous study shows that older adults (particularly those 75 and older) are prone to both cognitive impairment and sarcopenia (Tamura, 2018; Akune, 2014). In addition, sarcopenia was considered one of the core symptoms of physical frailty (Yamada 2013). Other underlying cause of sarcopenia include stress, hormones, malnutrition, and physical inactivity, all of which prone to elderly patients and to contribute to frailty through interactive pathways (Marcell 2003). Strategies such as nutritional supplementation and exercise may help and required to patients to prevent frailty and sarcopenia.

It is noteworthy that clinicians should provide more attention to patients with frailty for the prevention of sarcopenia because there is significant association between these two condition. In addition, formulating new strategy to prevent, treat and diagnose these conditions in the clinical arena would be essential. Identifying also the concepts of the two disease which can perceived and can be directly target a certain organ may need a combine treatment represent a possible solution. Future research may be needed to explore the association of other factors such as polypharmacy, malnutrition, and length of stay. This may help to determine clear objective, standardized, and clinically relevant definition and treatment for frailty at sarcopenia. This study presents some limitations such as it was performed only in one setting and cannot generalize the population in Saudi Arabia. Second, the design of the study which cannot determine the exact causal association between frailty and sarcopenia. Further longitudinal studies may need in more detail between the association of these two diseases. In conclusion, this research highlights the high prevalence of sarcopenia among elderly patients in Saudi Arabia and the percentage of frail subjects is 37% (mild – severe frailty). In addition, significant difference and association found with sarcopenia and frailty with many sociodemographic and clinical components of elderly patients in Saudi Arabia.

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6. Authors' contributions

All authors contributed to data analysis, drafting or revising the article, gave final approval of the version to be submitted for publication and agree to be accountable for all aspects of work.

Declaration of Competing Interest

The author declare that there is no conflict of interest.

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