Original Article

Frailty Syndrome in Older Adults and Related Sociodemographic Factors in the North of Iran: A Population-Based Study

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Abstract

Background: The global incidence rate of frailty syndrome among older adults aged 60 years and over has been estimated to be 43.4 cases per 1000 persons/years.
Objectives: This study aimed to determine the prevalence of pre-frailty and frailty syndromes in community-dwelling older adults and assess the correlated sociodemographic factors.
Methods: All elderly people recruited in the second phase of the Amirkola Health and Ageing Cohort Project, including 2135 older adults aged ≥60 years living in Amirkola, North of Iran, were invited to participate in this study using the census method. The standard "FRAIL" scale was used to assess the frailty syndrome. The individuals who obtained a score of three or more and one or two were classified as frail and pre-frail cases, respectively.
Results: Totally, 2010 older adults with a mean age of 70.41±7.65 years were included in this study. Out of them, 672 (33.4%; 95% CI: 31.37-35.50%) cases met the criteria for frailty syndrome, and 874 (43.5%) individuals were regarded as pre-frail. The prevalence of frailty was significantly higher in females (50.8%; 95% CI: 47.58-54.05%), compared to males (18.7%; 95% CI: 16.41-21.05%). Multivariate logistic regression analysis revealed that age ≥85 (OR=7.27; 95% CI: 4.12-24.46) and female gender (OR=2.67; 95% CI: 2.30-9.95) had the highest effect on frailty in older adults.
Conclusion: One out of every three elderly people (aged ≥60) in Amirkola, North of Iran, had frailty syndrome. Older age, female gender, lower education level, low level of satisfaction with income, marital status (single), living alone, and unemployment increased the risk of frailty in older adults.

Keywords: Asthenia, Debility, Elderly, Frailty, Muscle weakness

1. Background

Frailty syndrome (FS) is a clinically-recognizable state resulted from the accumulation of some comorbidities, such as reduced energy, low physical activity, unintentional weight loss, muscular weakness, and slower walking that can be observed with a higher incidence in older adults (1, 2). When there are one or two out of the mentioned deficits, the patient can be considered as a pre-frail person (1).

Since reduced immunity to stress factors and decreased functional reserves have been considered the important pathophysiologic mechanisms for the occurrence of this disorder, FS might lead to different adverse complications (2-4). Falls, fractures, dementia, and disability have been reported to be higher in frail individuals (5).

The global incidence rate of frailty among older adults (≥60) has been estimated to be 43.4 (95% CI: 37.3-50.4) cases per 1000 person/years (6). Moreover, its worldwide prevalence has been ranged from 4.0% to 59.1% in older adults aged ≥65 years, depending on the criteria used for FS definition (5). The prevalence of FS in low and middle-income countries has been reported to be 17.4% in people aged 60 years and over, which is higher than that in high-income countries (10.7%) (7, 8). Frailty is more common in females, compared to males (6, 8).

Frailty syndrome has important impacts on the health-care system (5, 9). The overall mortality risk in frail individuals is 3.49 (2.09-5.82) times higher than that in non-frail individuals (10). Furthermore, a reciprocal relationship has been found between the frailty syndrome and chronic disorders. Multiple chronic diseases are more prevalent in frail people, and frailty can be an outcome of the advanced stage of some disorders, such as malignancies, chronic renal diseases, and heart failure (4, 5, 11). It should be noted that decreased quality of life is another impact of frailty syndrome (1, 3, 5).

The increasing elderly population in Iran is comparable to that in many other countries across

the world (12, 13). Therefore, the issue of frailty and the identification of frail adults has been notified in recent years in Iranian studies (14, 15).

2. Objectives

This study aimed to determine the prevalence of frailty and pre-frailty in community-dwelling older adults and assess its association with sociodemographic factors.

3. Methods

This observational study was a part of the Amirkola Health and Ageing cohort Project (AHAP) (12, 16) and was carried out as a cross-sectional study from 2019 to 2020. All elderly people recruited in the second phase of the AHAP cohort project, including 2135 older adults aged 60 years and over living in Amirkola, north of Iran, were invited to participate in the study. No sampling was conducted, and all the elderly people were recruited in the study by a census method. Individuals whose related data were incomplete and who were unable to answer questions (due to severe speech impairment or severe hearing loss), as well as patients with cognitive impairment, were excluded from the study.

Sociodemographic characteristics including age, gender, level of education, marital status, living status, and occupation have been recorded through direct interviews with the elderly or their close relatives. In addition, the question of "How satisfied are you with your or your family's monthly income?" was asked from the participants, and the person's response was rated on a 5-point Lickert scale from very low to very high.

The standard "FRAIL" scale was used to measure the frailty (17, 18). This questionnaire includes five items to evaluate the person in terms of sufficient energy to do activities, ability to climb stairs, ability to walk without any assistance, identify other illnesses in the elderly, and unwanted weight loss in the previous six months. Each item was scored using zero or one (lack of enough energy to do activities=1; enough energy=0). Out of the total scores of the responses to these five questions, people who have obtained a score of three or more are known as frail, and the individuals who get a score of one or two are considered pre-frail individuals (17).

All participants were informed about the research through a Persian informed consent form. The study protocol was approved by the Ethics Committee of Babol University of Medical Sciences, Babol, Iran (IR.MUBABOL.HRI.REC.1397.144). The data were analyzed in SPSS software (version18) through the Chi-square test and logistic regression analysis to determine the role of different characteristics affecting the elderly's frailty.

4. Results

Totally, 2010 older adults with the mean age of 70.41±7.65 (age range:60-99) years, including 1089 (54.2%) males and 921 (45.8%) females were recruited in the research. Most of the participants (n=1204; 59.9%) were illiterate or had primary-school education level (n=429; 21.3%). Moreover, 1658 (82.5%) cases were married and 1814 (90.2%) individuals were living with others (not alone). Furthermore, 604 (29.9%) cases were in the age-group of 65-69 years, and two-thirds of the participants had very low (n=473; 23.5%) or low (n=795; 39.6%) level of satisfaction with their monthly income.

Out of the total participants in this study, 672 (33.4%; 95% CI: 31.37-35.50%) cases met the criteria for frailty syndrome, and 874 (43.5%) individuals were regarded as pre-frail. The prevalence of frailty was significantly higher in females (50.8%; 95% CI: 47.58-54.05%), compared to males (18.7%; 95% CI: 16.41-21.05%). Furthermore, the prevalence rates of pre-frailty were obtained at 40.3% and 46.2% in females and males, respectively (P<0.001). In addition, frailty showed an increase with increasing age, and 21.2% of the elderly in the age-group of 60-64 years had frailty syndrome, while this measure was estimated at 64.9% among those in the age-group of ≥85 (P<0.001). Table 1 summarizes the association of frailty and pre-frailty with the examined variables. Moreover, the prevalence of FS in different age-groups divided into males and females has been presented in Figure 1.

Table 1. Association of frailty and pre-frailty in older adults with the examined sociodemographic characteristics

Characteristics	Total Number (percent)	Assessment of frailty syndrome			P-value
		Normal Number (percent)	Pre-frail Number (percent)	Frail Number (percent)	
Level of education					
Illiterate	1204 (59.9)	183 (15.2)	506 (42.0)	515 (42.8)	
Primary school	429 (21.3)	121 (28.2)	205 (47.8)	103 (24.0)	<0.001
High school	256 (12.7)	98 (38.3)	115 (44.9)	43 (16.8)	
College education	121 (6.0)	62 (51.2)	48 (39.7)	11 (9.1)	
Marital status					
Single (Never married, divorced or widowed)	352 (17.5)	39 (11.1)	134 (38.1)	179 (50.9)	<0.001
Married	1658 (82.5)	425 (25.6)	740 (44.6)	493 (29.7)	

Table 1. Continued

Living status					
Living alone	196 (9.8)	25 (12.8)	82 (41.8)	89 (45.4)	<0.001
Living with others	1814 (90.2)	439 (24.2)	792 (43.7)	583 (32.1)	
Occupation					
Housewife or unemployed	1090 (54.2)	112 (10.3)	433 (39.7)	545 (50.0)	
Farmer or worker	218 (10.8)	59 (27.1)	128 (58.7)	31 (14.2)	<0.001
Employee or retired	464 (23.1)	200 (43.1)	199 (42.9)	65 (14.0)	
Other	238 (11.8)	93 (39.1)	114 (47.9)	31 (13.0)	
Satisfaction with the monthly income					
Very low	473 (23.5)	60 (12.7)	179 (37.8)	234 (49.5)	
Low	795 (39.6)	190 (23.9)	354 (44.5)	251 (31.6)	
Medium	690 (34.4)	194 (28.1)	323 (46.8)	173 (25.1)	<0.001
High	43 (2.1)	18 (41.9)	13 (30.2)	12 (27.9)	
Very high	9 (0.4)	2 (22.2)	5 (55.6)	2 (22.2)	
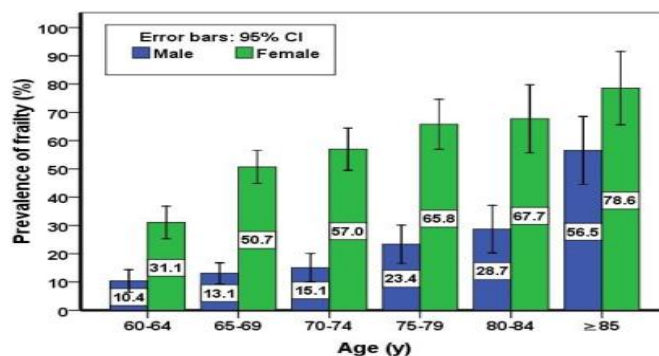
Figure 1. Prevalence of frailty syndrome in different age-groups of older adults, Amirkola, North of Iran

Multivariate logistic regression analysis results to evaluate the characteristics associated with frailty syndrome revealed that age ≥85 (OR=7.27; 95% CI: 4.12-24.46) and female gender (OR=2.67; 95% CI: 2.30-9.95) had the highest effect on frailty in older adults (Table 2).

Table 2. Multivariate logistic regression analysis evaluating the characteristics associated with frailty among older adults in north of Iran

Characteristics		Met the frailty criteria Number (percent)	Unadjusted logistic regression analysis		Adjusted logistic regression analysis	
			Crude Odds ratio (95% CI)	p-value	Adjusted Odds ratio (95% CI)	p-value
Gender	Male	201 (18.7)	4.48 (3.67-5.47)	<0.001	2.88 (2.09-3.96)	<0.001
	Female	468 (50.8)				
Age-groups (year)	60-64	102 (21.2)	1 (Reference)	-	1 (Reference)	-
	65-69	184 (30.6)	1.64 (1.24-2.17)	<0.001	1.70 (1.25-2.33)	<0.001
	70-74	128 (34.5)	1.96 (1.45-2.67)	<0.001	1.98 (1.40-2.80)	<0.001
	75-79	111 (41.4)	2.63 (1.90-3.65)	<0.001	2.88 (1.96-4.23)	<0.001
	80-84	75 (42.4)	2.74 (1.89-3.96)	<0.001	2.86 (1.85-4.44)	<0.001
	≥85	72 (64.9)	6.88 (4.40-10.75)	<0.001	7.27 (4.24-12.47)	<0.001
Satisfaction with the monthly income	Very low	234 (49.5)	1 (Reference)	-	1 (Reference)	-
	Low	251 (31.6)	0.47 (0.37-0.60)	<0.001	0.68 (0.52-0.89)	0.006
	Medium	173 (25.1)	0.34 (0.27-0.44)	<0.001	0.57 (0.42-0.76)	<0.001
	High	12 (27.9)	0.39 (0.20-0.79)	0.008	0.89 (0.40-1.99)	0.779
	Very high	2 (22.2)	0.29 (0.06-1.42)	0.127	0.42 (0.07-2.38)	0.127
Marital status	Single (Never married, divorced or widowed)	179 (50.9)	0.41 (0.32-0.52)	<0.001	1.00 (0.71-1.41)	0.993
	Married	493 (29.7)				
Level of education	Illiterate	515 (42.8)	1 (Reference)	-	1 (Reference)	-
	Primary school	103 (24.0)	0.42 (0.33-0.54)	<0.001	0.64 (0.48-0.85)	0.002
	High school	43 (16.8)	0.27 (0.19-0.38)	<0.001	0.57 (0.38-0.85)	0.006
	College education	11 (9.1)	0.13 (0.07-0.25)	<0.001	0.42 (0.21-0.85)	0.016
Living status	Living with others	583 (32.1)	1.76 (1.30-2.37)	<0.001	1.00 (0.71-1.41)	0.020
	Living alone	89 (45.4)				
Occupation	Housewife or unemployed	545 (50.0)	1 (Reference)	-	1 (Reference)	-
	Farmer or worker	31 (14.2)	0.17 (0.11-0.25)	<0.001	0.34 (0.21-0.55)	<0.001
	Employee or retired	65 (14.0)	0.16 (0.12-0.22)	<0.001	0.53 (0.35-0.78)	0.002
	Other	31 (13.00)	0.15 (0.10-0.22)	<0.001	0.40 (0.25-0.65)	<0.001

5. Discussion

According to the findings of this study, the prevalence rates of frailty and pre-frailty in older adults in Amirkola, north of Iran, were determined at 33.4% and 43.5%, respectively. This result is nearly similar to the finding of a study carried out by Alqahtani et al. in Saudi Arabia with a reported frailty prevalence of 28% ([19](#)) and that of a study performed by Akin et al. in Turkey (27.8%) ([20](#)). In a study carried out by Eyigor in Turkey, the prevalence rates of frailty and pre-frailty based on the hospital-based data were reported as 39.2% and 43.3%, respectively ([21](#)). Furthermore, Cakmur performed a study in rural areas of Turkey ([22](#)) and estimated the prevalence of frailty at 7%, which could be due to higher physical activity of this rural population, relatively younger age, group living in this region, and better economic status of the mentioned people. The prevalence rate of frailty in the present study was lower than that (47%) obtained by Kuwaiti et al. in the United Arab Emirates (UAE) ([23](#)) and the prevalence rate of 65% determined by Yadav et al. in Nepal ([24](#)). The higher prevalence of frailty in a study conducted by Yadav study can be attributed to the poverty and low socioeconomic status of the people, depression, low social support, and low level of physical activity in that region ([24](#)). In addition, in a study carried out by Khamis et al. in south Lebanon, the prevalence of frailty using the Groningen Frailty Indicator was reported as 81.3% ([25](#)).

Literature review represented a lower prevalence of frailty syndrome in some other countries. Martins et al. conducted a study in Japan and reported a prevalence rate of 13.5% in this regard ([26](#)). Moreover, the prevalence rates of frailty were estimated at 5.7% and 3.0% in the studies conducted by Vaingankar et al. in Singapore ([27](#)) and Hanlon et al. in the UK on people aged 37-73 years, respectively ([11](#)). Such a difference in the prevalence of frailty syndrome can be due to different demographic and socioeconomic characteristics of the study population and different criteria used for the definition of FS. In the current study, older age, female gender, lower education level, lower-income satisfaction, marital status (single), living alone, and unemployment have been represented as the characteristics associated with frailty in older adults.

Older age has been reported as an effective indicator of frailty in evidence ([20-23](#), [25-27](#)). The mean age of the study population affected the prevalence of frailty. The lower prevalence of frailty in some literature was attributed to the lower age of the participants, compared to similar studies ([11](#), [22](#)). It is noteworthy to mention that aging has an impact on other variables, such as lifestyle behaviors, physical activity, comorbid diseases, depressed mood, and resolution to homeostasis following stressor events ([11](#)).

According to the results, frailty was more common in females, which was consistent with the findings of previous studies ([23](#), [25](#), [28-31](#)). In a study carried out by Thompson et al. in Australia, the prevalence of frailty in females was reported to be twice that of males ([31](#)).

Females show a higher percentage of frailty due to their longer life expectancy and consequent chronic disorders ([25](#)). Furthermore, lower muscle mass and strength, poorer nutritional status, and sarcopenia can be associated with a higher prevalence of FS in females ([32](#)). However, in the studies performed by Vaingankar et al. ([27](#)) and Ng et al. ([33](#)) (Singapore), as well as Cakmur (Turkey) ([22](#)), and Martins et al. (Japan) ([26](#)), there was no association between frailty and gender, which was not consistent with the findings in this study.

In the same vein, low education level was significantly associated with the prevalence of frailty in older adults. This finding is consistent with the results of other studies in the literature ([21](#), [22](#), [25](#), [34](#), [35](#)); however, it is not in line with the findings of a study conducted in Belgium (36). Franse et al. reported the education level as one of the most consistently socioeconomic characteristics associated with frailty, morbidities, and self-rated health in adults aged 55 years and older ([35](#)). Since education level can be correlated with the level of health responsibility and self-care, self-efficacy, income, and socioeconomic status, the impact of the low education level on the prevalence of frailty can be justified ([34](#), [37](#)).

In our study, marital status (married) and living with a partner reduced the risk of frailty in older adults; however, the elderly living alone had a higher rate of frailty. This result is consistent with the findings of some other studies conducted by Hamidin et al. (Malaysia) ([38](#)), Kuwaiti et al. (the UAE) ([23](#)), and Pegorari et al. (Brazil) ([39](#)). On the other hand, it is not in line with the findings obtained by Eyigor et al. ([21](#)) and Runzer-Colmenares et al. ([30](#)). It seems that marital status (married) and living with a partner can improve the person's social support and reduce chronic diseases, cognitive disorders, depression, and occurrence of falls with an uncertain cause ([40](#)). To be socially isolated, lack of social attention and related economic characteristics might increase the occurrence of frailty syndrome in the elderly; in addition, divorce has been represented as an independent risk factor for the occurrence of frailty in some evidence ([28](#), [37](#)).

In the same line, lower-income satisfaction and unemployment increased the risk of frailty. This finding is in line with the results of the studies conducted by Khamis (south Lebanon) ([25](#)), Cakmur (Turkey) ([22](#)), Ocampo-Chaparro (Colombia) ([41](#)), and Yadav (Nepal) ([24](#)), where inappropriate socio-economic status and insufficient current income has been represented as important factors to reduce the

person's social support and predispose the person to frailty. Governmental policies and integrated programs for improving the socioeconomic status of adult people, especially middle-aged and older adults can prevent frailty in this population and promote healthy aging in different countries (42).

The most important strong point of the present study is the high participation rate of the elderly (2010 cases out of a total of 2135 elderly people). The cross-sectional design of this study is one of its limitations, and it is difficult to make a definite expression about the relationship between frailty and different characteristics.

6. Conclusion

One out of every three elderly people (aged ≥60) in Amirkola, north of Iran, had frailty syndrome. Older age, female gender, lower education level, insufficient income satisfaction, marital status (single), living alone, and unemployment increased the risk of frailty in older adults.

Footnotes

Authors' Contribution: FTB, SRH, RG, and AB contributed to conception and design, acquisition of data, analysis and interpretation of data. SM drafted the article. All authors have read the manuscript, revised it critically for important intellectual content and approved the final version of the article to be published.

Conflict of Interests: The authors declare that they have no competing interests.

Ethical Approval: This study has been approved by the Ethics Committee of Babol University of Medical Sciences, Babol, Iran (ID: IR.MUBABOL.HRI.REC. 1397.144). All participants provided a written informed consent form to participate in the research.

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Informed consent: All participants have been informed for personal characteristics or clinical details to be published in this study.

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