FRAILTY PREVALENCE AND CORRELATES AMONG FREE LIVING ELDERLY IN
AN EGYPTIAN RURAL ELDERLY

Somaia M. Ebeid., Rania M. El akkad., Mortagy A.
Kamel., Nesrine E.Shafeek
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RESEARCH ARTICLE

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Somaia M. Ebeid[1]., Rania M. El akkad[1]., Mortagy A. Kamel[1]., Nesrine E.Shafeek[1] and Nahla Fawzy Abou elezz[2]

[1]Department of Community, Environment and Occupational Medicine Faculty of Medicine
[2]Ain Shams University, Cairo, Egypt

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ABSTRACT

Background: frailty is a common association with aging, multi-factorial in origin and has significant impact on the overall health and functional status of the elderly. ***Aim:*** The purpose of this study was to describe the prevalence of frailty in a community dwelling egyptian elderly and examine its associations with sociodemographic and functional characteristics in a representative sample of rural elderly. ***Methodology:*** Eighty eight elderly males and females were recruited from a rural district in Dakahlia, Egypt. After aconsent was taken the following was done for each participant:-comprehensive geriatric assessment, history taking and examination including functional and nutritional assessment. ***Results:*** among the participants 24(27. 3%) were pre frail and 21(23.9%) were frailby using SOFA score. Assessment of the nutritional status by using mini nutritional assessment (MNA) showed that 24(27.3%) had a risk of malnutrition and 11(12.5%) were malnourished. There was a statistically significant correlation between frailty status and the following: male gender, malnutrition, depression, low performance on MMSE, more dependent state on ADL&IADL and worse performance of up and go test. by regressive analysis male gender and poor performance of up and go tests were statistically significant predictors of frailty. **Conclusion& Recommendation:**

- Frailty is prevalent condition among the studied sample and it exerts bad impact on the functional status of the elderly so functional assessment of the elderly especially frail one is crucial
- Up and go test is an emerging important tool to predict frailty
- Still the field of frailty among the elderly is lacking and need more efforts to explore its relations more.

INTRODUCTION

According to data from The World Factbook, people aged 65 years and older represent 8.32% of the world population[1]. Along with growing population of the elderly the need to evaluate geriatrics syndromes in order to their overcome negative effects is becoming more urgent.

Frailty is a common geriatric syndrome which gained growing interest in geriatric research. Frailty is characterized by increased vulnerability to serious health outcomes and functional decline[2,3].

Frailty develops as a result of age-related decline in various physiological systems leading to a state of vulnerability and impaired ability to adapt to external stressors and an increased risk of dependency and adverse outcomes[2].

Characterising population subgroups at risk of frailty and relationships between frailty, social circumstances, depressive symptoms, cognition and other health-related factors will help identify modifiable intervention targets which may reduce the burden of frailty for individuals and help give directions for public health policy[4].

The objective of the study is to describe the prevalence of frailty in a community dwelling Egyptian elderly and examine its associations with sociodemographic and functional characteristics.

*Corresponding author: **Somaia M. Ebeid**
Department of Community, Environment and Occupational Medicine Faculty of Medicine

METHODOLOGY

Study design

Cross sectional study.

Sample size

It is a community based, door to door designed study

A sample of 83 elderly was calculated using Epi-Info 7 program using prevalence of frailty among elderly population of 18.6% [5] with S.D=9% confidence interval 97%

Setting

The participants were recruited from Meet Abbad-Nabaroh - Dakahlia., where 150 elderly are living there according to[6] , but only 88 elderly participated in the current study, ten were excluded because of sever cognitive impairment.

Subjects

Eighty eight elderly 60 years and older, both males & females.

METHODOLOGY

All subjects were subjected to the following:

1. Aconcent to participate in the study was taken
2. Comprehensive geriatric assessment including: Careful history taking, physical examination which includes: measurement of weight, height, waist to hip ratio and body mass index (BMI), assessment including:

   a. Assessment of cognitive function using minimental state examination (MMSE)[7] arabic version[8].
   b. Assessment of mood using geriatric depression scale GDS[9], arabic version[10].
   c. c-Assessment of function using activity of daily living (ADL) and instrumental activity of daily living (IADL)[11,12].
   d. assessment of mobility using timed up and go test[13].
   e. assessment of nutritional status by (MNA) mini nutritional assessment[14].
   f. Assessment of frailty using the Study of Osteoporotic Fractures (SOF) criteria, which are regarded to be just as effective as the frailty criteria of Fried *et al ,2001,* in predicting adverse health outcomes but are easier to apply[15].

The SOF index is composed of three items

1. unintentional weight loss > 5% in the past year
2. inability to rise from a chair five consecutive times without using the arms,
3. self-perceived reduced energy level as described by a negative answer to the question "*do you feel full of energy?*".Subjects are considered "frail" if at least two of the three criteria are fulfilled, "pre-frail" if only one criterion is present and "robust" if none of the criteria are present.

Statistical analysis

- Quantitative data e.g. age are presented as mean ± standard deviation. Independent t test is used to compare such data between two groups and one-way ANOVA is used when more than two groups are to be compared.
- Qualitative data e.g. sex, are presented as count and percentage. Chi-squared test is used to compare such data between two or more groups.
- The r² value represents the proportion of variation of the dependent variable that is predicted from the independent variable. An r² of 1.0 indicates that all the plotted points lie on a straight line and that the dependent variable can be predicted from the independent variable with 100%.
- Binary logistic regression was used to predict the outcome (0 = normal, 1 = frail) from age, gender, Mini nutritional assessment, Up and go test, MMSE, GDS, ADL, IADL

Ethics

The study was approved by the scientific board of Geriatrics and Gerontology department, faculty of medicine Ain Shams University.

RESULTS

Demographic description of the participants

1. Sixty one (69.3%) were young old, 26(29.5%) were among the old group and only one subject was among the oldest group.
2. Males were 28(32%) and females were 59(67.8%) of the participants
3. Ten subjects(11.4%) complained of 3 chronic diseases,22(25%) complained of 2chronic diseases, 45(51.1%)complained of one chronic disease, only one(1.1%) complained of 4 chronic diseases and 10(11.4%) had no recorded chronic disease. and the distribution of these chronic diseases were as follow: 38(43.2%) were hypertensive, 23(26.1%)were diabetic,17(19.3%) with chronic liver disease, 17(19.3%) with osteoarthritis,8(9.1%) had chronic bronchitis, 11(12.5%) had cardiac disease and 8(9.1%) had gastrointestinal disease.

Functional and nutritional assessment

Assessment of the frailty status by using SOFA score, 43(48.9%) were robust, -
24(27. 3%) were pre-frail and 21(23.9%) were frail.

   a. Assessment of the nutritional status by using the MNA, it was found that: 53(60.2%0 were normal, 24(27.3%) had a risk of malnutrition and 11(12.5%) were malnourished
   b. Assessment of the functional status by using :

ADL: 75(73.9%%) were independent,12(13.6%)were assisted and only one subject(1.1%) was dependent.

IADL: 65(85.2%) were independent,21(23.9%)were assisted and only 2 subjects(2.3%) were dependent.

And assessment of the mobility status using up &go test: 16(18.2%) were normal,39(44.3%) were in need of further assessment and 33(37.5%) had impairment of mobility.

Correlations of the frailty status

Corelation between frailty status and age and gender **(table 1&2)**

By using chi-square test, there was no statistically significant difference between the three age groups, but there was a statistically significant difference regarding gender (p value 0.006) with higher prevalence of frailty among males.

Table 1

Age group	Frailty index			Total
	Normal (robust)	Prefrail	Frail	
Young old (60- 74) N (%)	35 (57.4)	16 (26.2)	10 (16.4)	61 (100)
Old (75-84) N (%)	8 (30.8)	8 (30.8)	10 (38.5)	26 (100)
85 N (%)	0 (0)	0 (0)	1 (100)	1 (100)

X^2 = 9.7   p= 0.045

Table 2

Gender	Frailty index			Total
	Normal (robust)	Pre-frail	Frail	
Male N (%)	20 (71.4)	2 (7.1)	6 (21.4)	28 (100)
Female N (%)	23 (39)	22 (37.3)	14 (23.7)	59 (100)

X^2 = 10.34   p= 0.006

Correlation between frailty status and nutritional and functional status of the participants

There was statistically high significant correlation between frailty status and the level of functionality by using ADL and IADL tools with p value(0.00) for both *(table3&4).*

Table 3

ADL	Frailty index			Total
	Normal (robust)	**Pre-frail**	**Frail**	
Independent	43 (57.3)	20 (26.7)	12 (16.0)	75 (100)
Assisted	0 (0)	4 (33.3)	8 (66.7)	12 (100)
Dependant	0 (0)	0 (0)	1 (100)	1 (100)

X^2 = 21.48   p= 0.00

Table 4

IADl	Frailty index			Total
	Normal (robust)	Pre-frail	Frail	
Independent	40 (61.5)	16 (24.6)	9 (13.8)	65 (100)
Assisted	3 (14.3)	8 (38.1)	10 (47.6)	21 (100)
Dependent	0 (0)	0 (0)	2 (100)	2 (100)

X^2 = 22.42   p= 0.00

Scoring on MMSE was higher among the control group followed by the prefrail and least scoring was among the frail group and this association between cognitive impairment and frailty status was highly statistically significant(p value 0.00). *(table 5)*

Table 5

MMSE	N	Mean	Std. Deviation	Sig.
Normal (robust)	43	27.09	2.608	
Prefrail	24	25.08	2.552	F= 10.29
Frail	21	23.52	4.226	p=0.00
Total	88	25.69	3.364	

The mean value of GDS scoring among the frail group was 6.14, indicating prevalence of depression among the group. While among the control and prefrail groups were not and this difference was highly statistically significant(p value 0.00) *(table 6).*

Table 6

GDs	N	Mean	Std. Deviation	Sig.
Normal (robust)	43	2.98	2.231	
Prefrail	24	4.63	2.795	F= 11.24
Frail	21	6.14	2.920	p=0.00
Total	88	4.18	2.851	

The worst results of up and go test was among the frail group with highly statistically significant difference between the three groups (p value 0.00)(table7).

Table 7 Relation between up and go test and frailty

up and go test	Frailty index			Total
	Normal (robust)	Pre-frail	Frail	
0 -10sec	14	2	0	16
	87.5%	12.5%	0.0%	100.0%
11 - 20 sec	25	11	3	39
	64.1%	28.2%	7.7%	100.0%
20 sec	4	11	18	33
	12.1%	33.3%	54.5%	100.0%

X^2 = 38.7 p=0.00

Frailty status exist more among those who are malnourished or at risk of malnutrition with highly statistically significant correlation (p value 0.008). (table8)

Table 8 Relation between mini nutritional assessment and frailty

mini nutritional assessment	Frailty index			Total
	Normal (robust)	Pre-frail	Frail	
Normal (12 - 14) N (%)	32 (60.4)	11 (20.8)	10 (18.9)	53 (100.0)
danger of malnutrition(9 - 11)) N (%)	6 (25.0)	12 (50.0)	6 (25.0)	24 (100.0)
malnutrition (8) N (%)	5 (45.5)	1 (9.1)	5 (45.5)	11 (100.0)
Total N(%)	43 (48.9)	24 (27.3)	21 (23.9)	88 (100.0)

Chi-square= 13.6   p= 0.008 fisher exact 0.0

Statistically there was no significant correlation between frailty and number of comorbidities (p value 0.28) or number of medications (p value 0.28)

Binary logistic regression analysis was statistically significant (F= 54.& p=0.00) The coefficient of determination of the model was 46.5% the ***gender*** was statistically significant (p=0.048) and odds ratio 4.48 (C.I. = 1.011 – 19.87) and the ***up and go test*** was statistically significant (p=0.001) and had an odds ratio of 6.4 (C.I. = 2.06 – 19.87). (table11).

Table 9 correlation between frailty and number of comorbidities

Number of Co-morbidities	Frailty index			Total
	Normal (robust)	Pre-frail	Frail	
1 N (%)	31 (54.4)	15 (26.3)	11 (19.3)	57 (100.0)
2 N (%)	10 (50.0)	5 (25.0)	5 (25.0)	20 (100.0)
3 N (%)	2 (20.0)	4 (40.0)	4 (40.0)	10 (100.0)
4 N (%)	0 (0.0)	0 (0.0)	1 (100.0)	1 (100.0)

$X^2= 7.5$ p=0.28

Table (10) correlation between frailty and number of medications

Number of Medication	Frailty index			Total
	Normal (robust)	Pre-frail	Frail	
0 N (%)	1 (100.0)	0 (0.0)	0 (0.0)	1 (100.0)
1 N (%)	32 (51.6)	17 (27.4)	13 (21.0)	62 (100.0)
2 N (%)	6 (40.0)	6 (40.0)	3 (20.0)	15 (100.0)
3 N (%)	3 (37.5)	1 (12.5)	4 (50.0)	8 (100.0)
4 N (%)	1 (50.0)	0 (0.0)	1 (50.0)	2 (100.0)

$X^2= 7.5$ p=0.28

Table 9 Regressive analysis to detect frailty predictors:

	Sig.	Odds Ratio	95% C.I .for Odds Ratio	
			Lower	Upper
Gender	**.048**	4.481	1.011	19.872
Up and go test	**.001**	6.402	2.062	19.874
Constant	.998	.000		

F= 54.   p=0.00

DISCUSSION

The purpose of the current study was to assess the prevalence of frailty status by using SOF criteria among elderly Egyptians living in a rural area, and to find out the predictors of frailty among this population.

Regarding the prevalence of frailty, it was found that about 24% (21) were frail, about 27% (24) were pre-frail, while about 49% (43) were non frail (robust), that is to say about half (50%) of the studied group are either frail or pre-frail, according to SOF criteria[15].

This high prevalence agrees with a cross-sectional study by [16], according to SOF criteria (30%) were "robust", (37%) were "pre frail" and   (33%) were "frail". While in another study by[17], in which frailty was defined as the presence of three out of five criteria; shrinking/weight loss, weakness, poor endurance and energy, slowness and low physical activity, found a prevalence of 7% in men and women aged 65 years and older.

This high prevalence in frailty status found in our study can be explained by the rural setting of the elderly where there is low socioeconomic status, high prevalence of illiteracy and limited access to health care services and all these had been associated with frailty in several cross-sectional studies as [17-20].

Concerning the relationship between two multidimensional variables, malnutrition and frailty, we found a strong correlation between them, as among non frail elderly about 74.5% had normal MNA (well nourished) and only about 16% were malnourished, by MNA, and also about 69% of the malnourished or at risk of malnutrition were frail or pre-frail, with highly statistically significant correlation. (p value 0.008).

Studies found this association, as[21] who found that about half of the frail participants were at risk of malnutrition and that over 90 % of those at risk of malnutrition were frail or pre-frail, also[22] found that among robust individuals nearly 90% were considered as well-nourished and only 1.8% as malnourished.

The strong association between frailty and malnutrition or even risk of malnutrition is considerably due to overlap of common socio demographic, physical and cognitive correlates.

Also, the two distinct domains, malnutrition and frailty, share similar presenting symptoms as weight loss and reduced energy level which can be related to depressive conditions as assessed in the neuropsychological item of the MNA.

Additionally, we can say that inability to rise from a chair and reduced energy level reflect loss of muscle mass (sarcopenia), which is a cornerstone in frailty, and can also reflect malnutrition.

Frail participants found in this study were found to be older, male gender, more functionally dependent in ADL and IADL, had more depressive symptoms by GDS, had more cognitive impairment by MMSE and had more risk of falls and functional mobility limitations as assessed by the timed up and go test.

Several studies support these findings, as in a study including 1933 elderly from Mexico City, depressive disorders, cognitive impairment, and functional decline were strongly related to frailty[23] . Also in 3-year follow up study by[24], they found that frailty is predictive of disability, as baseline frailty was strongly associated with ADL disability, also they found a strong prospective relationship between depressive symptoms and the onset of frailty, suggesting that depression may contribute to the etiology of frailty.

Another study found that, Central nervous system (CNS) function and cognitive impairment have been hypothesized to be either components of frailty or risk factors   as reported by[25].

By regression analysis to detect frailty predictors, it was found that both the male gender and the timed up and go test were independent predictors of frailty, also correlation between TUG test and frailty showed a high statistical significance, indicating that TUG time increased more with frail and pre-frail elderly.

Regarding the timed up and go test the current result agree with[26], who found that a clear increase in TUG time with increasing frailty, in fact they assume that TUG is a sensitive and specific measure of frailty that offers advantages in its measurement where the full application or interpretation of Fried's criteria is impracticable, further studies are needed to proof this.

This study has several strength points, this is the first study on rural Egyptian community dwelling elderly, showing the high prevalence of frailty and malnutrition in this community. Also, the instruments used to assess frailty, SOF criteria, and that used for malnutrition, MNA SF, are validated, simple and

easily applicable tests to this group of elderly with high prevalence of illiteracy and low socioeconomic status.

A clear limitation of the study is the relatively small sample size.

CONCLUSION AND RECOMMENDATION

1. Frailty status is a prevalent condition among the studied sample and exerts bad impact on the functional status of the elderly so functional assessment of the elderly especially frail one is crucial

2. Up and go test is an emerging important tool to predict frailty,\ , being an easy tool and can be adminstered by a non professional trained personnel so recommendation to be an essential measure when assessing community dwelling elderly is important

Conflict of interest: On behalf of all authors, there is no conflict of interest.

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