Original Contribution/Clinical Investigation

Correlation of Frailty Status to Health Related Quality of Life in the elderly: a cross-sectional study on community-dwelling older adults referred to an outpatient geriatric service in Egypt

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ABSTRACT

Frailty is a common, heterogeneous, geriatric syndrome associated with adverse health events. There is a lack of knowledge concerning the relationship between two multidimensional variables: frailty and quality of life (QOL).

Aim: was to investigate the relationship between frailty and health-related quality of life (HR-QOL) among community dwelling non demented elderly.

Method: 115 non demented elderly, 60 years and older recruited from outpatient geriatric clinic at Al Mansoura General Hospital, Dakahlia, Egypt. Each participant underwent Comprehensive geriatric assessment, assessing the health related Quality of life (HR-QOL) by the RAND-36 health survey and assessing frailty by Edmonton frail scale (EFS).

Results: Frailty significantly correlates with all the 8 dimensions of the HR-QOL even after controlling for covariates. Also frailty status significantly correlates with age, education, Body Mass Index (BMI), function, depression and cognition. By linear Correlation coefficient a significant correlation between frailty and HR-QOL, age, function, cognition and depression was found. Conclusion: Dimensions of HR-QOL were negatively affected by frailty and that possible correlates of frailty status were age, low socioeconomic status, low body mass index, functional dependence, depression and cognitive impairment. Effort to improve quality of life for frail elders in this population is important.

Key words: Community dwelling elderly, Frailty, Quality of life.

Introduction

Aging involves progressive decline in the functional reserve of multiple organs and systems due to limitation in functional reserve, damage from environmental agents, increased prevalence of chronic diseases and the emergence of a number of conditions termed geriatric syndrome (1). One of these syndromes is Frailty. It is a syndrome of decreased reserve and resistance to stressors, resulting from cumulative declines across multiple physiologic systems, causing vulnerability to adverse health outcomes including falls, hospitalization, institutionalization and mortality (2-8). The frailty phenotype model(4) has been defined as any three of weight loss, self-reported exhaustion, low activity levels, low walking speed and low grip strength.

Frailty is multidimensional, heterogeneous and unstable, thus distinguishing it from disability or ageing alone (9). Rather, it is widely conceived of as a state of vulnerability. Frailty is measured in many ways, including 'rules based' instruments, summative impairment lists and algorithms derived from clinical judgment (10-12).

Frailty is highly prevalent in older people; up to 40% of older people can be considered as frail and an increasing trend can be expected (13). Next to its high prevalence, frailty is characterized by its seriousness as it is related to an increased risk of adverse health outcomes such as disability (14), functional decline, hospitalization and death (15,16). These poor outcomes, in turn, can have negative implications on health related quality of life (HRQOL) (17-19).

HR-QOL is defined as: "The value assigned to the duration of life as modified by the impairments, functional states, perceptions and social opportunities that are influenced by disease, injury, treatment or policy (20) HR-QOL, however, it involves more than a self-assessment of functional status; it also conveys an individual's sense of satisfaction with that level of functioning" (21).

Only very few randomized controlled trials targeting frail older people have considered QOL among outcomes (22).

Until now, research on frailty has largely ignored the effect of frailty on psychosocial outcomes such as health related quality of life. In order to explore the extent to which frailty permeates a person's life, we examined the relationship between frailty and health related quality of life in a sample of older Egyptians.

As intervention in the early stages of frailty may lead to reversal of the syndrome and minimize if not prevent some of its associated adverse outcomes (23), so interventions to prevent, delay, or reverse frailty may have a beneficial impact on the health related quality of life in the elderly.

The current study examines the relationship between frailty and HR-QOL in community dwelling non demented elderly, while accounting for other domains of clinical importance such as cognition, functional limitation and depression.

Subjects and Method

Study population was 115 non demented elderly patients 60 years and above recruited from the outpatient geriatric clinic at Al Mansoura General Hospital, Egypt, both males and females, with consent to participate and able to answer the questionnaire during the interview.

Participation was based on informed consent from all participants and the study was approved by the scientific board of Geriatrics and Gerontology department, Faculty of Medicine, Ain Shams University.
Each participant was assessed by an experienced clinician and underwent Comprehensive Geriatric Assessment (CGA) in the form of;

a) Detailed medical history, and clinical examination.

b) Assessment of cognitive function using the -
1) Mini Mental state Examination (MMSE) (24). The MMSE is a brief 30-point questionnaire test that is used to screen for cognitive impairment. It is commonly used in medicine to screen for dementia. The MMSE examines orientation, immediate and short-term memory, attention and calculation, language and praxis. An Arabic version was used (25).

Age, education, cultural and socioeconomic background can cause a considerable bias in the MMSE's scores (26), so results were correlated with the age and educational level of the participants.

c) Screening for depression by Geriatric depression scale 15 items (27), using an Arabic version (28).

d) Functional assessment
By Activities of Daily Living (ADL) (personal care, clothing, moving, going to the toilet, eating) were measured with the Katz scale (29). The total score ranges from 0 to 6 with higher scores meaning better function (29) . The Lawton's assessment scale was used to assess abilities in Instrumental Activities of Daily Living (IADL), such as making phone calls, shopping, driving and using money (30). The scores range from 0 to 8 with higher scores meaning better function (30).

e) Assessment of Health Related Quality of Life (HR-QOL)
HR-QOL is measured with the RAND-36 Arabic version (31). The tool includes the same items as those in the SF-36 and the MOS-36 (32). It is a frequently used instrument in the research of HR-QOL in relation to aging (33). The RAND- 36 measures the perception of health on eight dimensions: physical functioning, social functioning, role limitations due to physical problems, role limitations due to emotional problems, emotional well-being, energy/fatigue, bodily pain and general health perception. The scores are converted to a 0 to 100 scale, with higher scores indicating higher levels of well-being or functioning (31).

The RAND-36 has proven to have a good validity (31).

f) Assessment of frailty by the Edmonton Frail Scale (EFS),

The EFS (34) samples 10 domains; Two domains are tested using performance-based items: the Clock test (35) for cognitive impairment and the 'Timed Get Up and Go' (36) for balance and mobility. The other domains are mood, functional independence, medication use, social support, nutrition, health attitudes, continence, burden of medical illness and quality of life (all standard historical items in geriatric assessment). The maximum score is 17 and represents the highest level of frailty, on a proposed five-level categorization (robust = 0-4, apparently vulnerable (pre-frail) = 5-6, mildly frail = 7-8, moderately frail = 9-10, severely frail = 11-17 (34).

The EFS correlated significantly ($r= 0.64$, $p<0.001$) with the Geriatrician's clinical impression of frailty (based on a 1 hour CGA) and medication count ($r= 0.34$, $p<0.001$) (34).

A unique characteristic of the EFS as a clinical frailty instrument is its inclusion of the domain of social support, suggesting an endorsement of the dynamic model of frailty (37).

g) Assessment of body mass index (BMI):

We classified subjects as regards to BMI according to National Institutes of Health guidelines regarding body size classification (38). Body mass index (BMI) categories (underweight, normal weight, overweight, or obese)

The following subjects were excluded from the study:
- Those with severe cognitive impairment as detected by MMSE ≤10 = severe impairment (39).
- Those with either severe hearing, visual and functional impairments preventing them from completing the questionnaires.

There have been reports about the adverse effects of age, severe cognitive impairment and physical status on rates of self-completion of the SF-36 (40-42).

All the questionnaires were done with face-to-face interview with each participant, as high illiteracy level was present between the participants and to avoid the problems associated with self-completion.

Statistical analyses

Statistical presentation and analysis of the present study was conducted, using the chi-square for qualitative data and T- test and ANOVA for quantitative data and Linear Correlation Coefficient; also ANCOVA for analysis of co variants by SPSS V18.

Results

Among the 115 non-demented participants, 74.78% (n=86) were 60 to 74 years old, 25.22% (n=29) were 74 to 85 years, mean age was 67.452 ± 5.382, 37.39% (n=43) were males and 62.61% (n=72) were females. The majority of the participants were illiterate 59.13% (n=68), 29.57% (n=34) can read and write and only 2.61(n=3) had primary education, 7.83% (n=9) had secondary education and 0.87% (n=1) had high education.

According to EFS, robust represented 44.35% (n=51), pre frail was 20.87% (n=24), while mild frailty represented 15.65% (n=18), moderate frailty was 13.91% (n= 16) and severe frailty was 5.22% (n=6) of the studied sample.

Table 1 (next page) presents baseline characteristics of the participants stratified by frailty status.

Regarding demographic data and past medical history, it was found that the frail group were older, had greater prevalence of stroke, widowhood and had lower education than the non frail group.

Regarding MMSE, ADL and IADL those who were frail had lower scores than the non-frail and pre-frail participants, and the increase in the level of frailty was associated with worse scores in MMSE, ADL and IADL, that is to say that the severely frail had lower scores than those with moderate and mild frailty. (Table 2, page 7)

Regarding GDS, those who were frail had lower scores than the non-frail and pre-frail participants and the highest GDS scores were found in the severe frailty group compared to the moderate and mild frailty groups. (Table 2)

The same pattern was found for HR-QOL scores on the RAND-36 scales, in that those who were frail had lower scores than the non-frail and pre-frail participants, and the worst scores were found in the severe frailty group compared to the moderate and mild frailty groups. (Table 2)

Regarding BMI, it was found that the frail groups (mild, moderate and severe) were significantly more underweight than the robust group. (Table 1)

We wanted to determine the true correlation between frailty and HR-QOL, therefore we performed multiple regression analyses by analysis of co-variants (ANCOVA) controlling for confounders (age, ADL, IADL, GDS, MMSE and education) and we found that still there is a significant correlation between RAND-36, assessing HR-QOL, and frailty assessed by EFS (Table 3, page 8)

By Linear Correlation Coefficient, there was a negative significant correlation between EFS and all the 8 RAND-36 subscales (assessing HR-QOL), ADL, IADL and MMSE while there was a positive significant correlation between EFS and age and GDS.(Table 4, page 8).

BMI significantly correlates to Edmonton frail scale scores. Underweight elderly show higher EFS scores than normal weight elderly as shown in Table 5, page 8.

Table 1: Characteristics of participants according to Edmonton frail scale (EFS) by number and % (n (%)

		Normal	Pre-frail	Mild frail	Moderate frail	Severe frail	Chi-Square
SEX	Male	24(47.06%)	7(29.17%)	7(38.89%)	5(31.25%)	0	
	Female	27(52.94%)	17(70.83%)	11(61.11%)	11(68.75%)	6(100%)	0.072
Marital status	married	31(60.78%)	11(45.83%)	7(38.89%)	3(68.75%)	0	**0.005***
	single	4(7.84%)	5(20.83%)	1(5.56%)	2(12.50%)	0	
	widow	14(27.45%)	8(33.33%)	10(55.56%)	11(68.75%)	6(100%)	
	divorced	2(3.92%)	0	0	0	0	
Living arrangement	alone	2(3.92%)	1(4.17)	1(5.56%)	0	0	0.195
	with family	47(92.16%)	22(91.67%)	17(94.44%)	12(75.00%)	6(100%)	
	with care giver	2(3.92%)	1(4.17%)	0	4(25.00%)	0	
Education	illiterate	16(31.37%)	17(70.83%)	15(83.33%)	14(87.50%)	6(100%)	
	can read and write	25(49.02%)	5(20.83%)	3(16.67%)	1(6.25%)	0	**<0.001***
	1ry education	0	2(8.33%)	0	1(6.25%)	0	
	2ry education	9(17.65%)	0	0	0	0	
	high education	1(1.96%)	0	0	0	0	
Smoking	smoker	12(23.53%)	2(8.33%)	3(16.67%)	2(12.50%)	0	0.249
	non smoker	39(76.47%)	22(91.67%)	15(83.33%)	14(87.50%)	6(100%)	
OA		18(35.29%)	13(54.17%)	7(38.89%)	8(50.00%)	1(16.67%)	0.331
COPD		3(5.88%)	1(4.17%)	0	2(12.5.)	0	0.416
Cardiac diseases (heart failure- IHD)		7(13.73%)	5(20.83%)	5(27.78%)	5(31.25%)	0	0.218
stroke		2(3.92%)	3(12.50)	4(22.22%)	1(6.25%)	3(50.00%)	**0.023***
cataract		3(5.88%)	4(16.67%)	4(22.22%)	3(18.75%)	0	0.183
BMI	less than 19 is under weight	1(1.96%)	2(8.33%)	6(33.33%)	11(68.75%)	3(50.00%)	**<0.001***
	(19-25) is normal	34(66.67%)	11(45.83%)	5(27.78%)	4(25.00%)	3(50.00)	
	(25-30) is overweight	16(31.37%)	9(37.50%)	7(38.89%)	1(6.25%)	0	
	more than 30 is obesity	0	2(8.33%)	0	0	0	**<0.001***

Table 2: Characteristics of participants according to Edmonton frail scale (EFS)(by Mean and SD) (M ± SD)

	EFS					Chi-Square
	Normal	Pre- frail	Mid- frail	Moderate- frail	Severe- frail	P-value
QOL-PF	66.373±15.559	54.375±13.131	45.00±11.376	31.563±12.072	15.00±13.416	< 0.001*
QOL-R P	81.863±19.415	58.333±22.921	38.889±17.620	32.813±15.052	20.833±10.206	< 0.001*
QOL-BP	59.137±12.957	46.500±12.025	44.222±11.430	37.813±11.962	31.333±8.501	< 0.001*
QOL-GH	53.451±8.443	45.917±11.275	41.111±7.962	36.133±7.511	28.333±6.831	< 0.001*
QOL-EF	58.137±10.098	48.125±10.715	38.056±8.069	34.063±9.349	21.667±9.309	< 0.001*
QOL-SF	67.892±9.439	57.813±11.547	48.611±5.893	35.156±11.382	20.833±10.206	< 0.001*
QOL-RE	88.245±17.403	66.683±19.669	50.00±17.84	56.244±16.018	38.867±13.635	< 0.001*
QOL-EW	70.745±5.741	65.667±9.721	60.667±11.083	64.500±9.675	59.333±5.888	< 0.001*
age	65.137±4.191	66.917±6.413	69.278±4.522	72.563±3.829	70.167±4.665	< 0.001*
ADL	6.000±0.00	5.833±0.381	5.278±0.752	4.438±1.094	2.167±2.483	< 0.001*
IADL	7.980±0.140	7.458±0.658	6.500±1.043	5.250±1.183	3.000±1.265	< 0.001*
GDS	3.000±0.872	3.667±1.007	4.056±0.938	4.500±0.966	5.333±1.033	< 0.001*
MMSE	24.510±2.436	22.958±2.368	20.778±1.353	20.188±2.562	19.500±0.837	< 0.001*

Table 3: Correlation between RAND-36 and Edmonton frail scale after adjustment for age, education, MMSE, ADL, IADL and GDS.

	ANCOVA (Edmonton frail scale)	
	F	P-value
QOL-PF	3.25	<0.001*
QOL-RP	5.97	<0.001*
QOL-BP	3.77	<0.001*
QOL-GH	3.77	<0.001*
QOL-EF	4.29	<0.001*
QOL-SF	4.76	<0.001*
QOL-RE	7.95	<0.001*
QOL-EW	5.61	<0.001*

QOL= quality of life,PF= Physical functioning, RP=Role limitation-physical, BP= Bodily Pain, GH= General health, EF= Energy/fatigue, SF=Social functioning, RE=Role limitation-emotional, MH= Mental health

Table 4: Linear Correlation Coefficient between EFS scores and different variables:

	Edmonton Frail Scale	
	r	P-value
MMSE	-0.622	<0.001*
Age	0.438	<0.001*
ADL	-0.677	<0.001*
IADL	-0.815	<0.001*
GDS	0.615	<0.001*
QOL- PF	-0.733	<0.001*
QOL-RP	-0.734	<0.001*
QOL-BP	-0.590	<0.001*
QOL-GH	-0.646	<0.001*
QOL-EF	-0.746	<0.001*
QOL-SF	-0.782	<0.001*
QOL-RE	-0.675	<0.001*
QOL-MH	-0.428	<0.001*

QOL= quality of life, PF= Physical functioning, RP=Role limitation-physical, BP= Bodily Pain, GH= General health, EF= Energy/fatigue, SF=Social functioning, RE=Role limitation-emotional, EW=emotional well-being, MMSE= mini mental state examination, GDS= geriatric depression scale, ADL= activities of daily living, IADL= instrumental activities of daily living

Table 5: Correlation between Edmonton frail scale and BMI

		BMI				ANOVA	
		Underweight	Normal weight	Overweight	Obesity	F	P-value
Edmonton Frail scale	Mean	8.261	4.561	4.606	5.000	13.371	<0.001
	SD	2.580	2.713	2.015	0.000		

BMI = Body mass index
P-values were calculated by ANOVA test.
Significant P-value (<0.05)

Discussion

In this cross-sectional study of the complex relationship between frailty status and HR-QOL in a sample of community-dwelling non demented older outpatients, we used two recently validated assessment tools: the EFS to assess frailty, it has five-level categorization of the frailty status from robust to pre-fail to mild to moderate to severe frailty, and this categorization is not found in most frailty scales as reported by Rolfson et al (34), and the RAND-36 health survey to assess HR-QOL. It is a frequently used instrument in the research of HR-QOL in relation to aging, Hickey et al (43).

The correlation between frailty and QOL; our results indicate that frail subjects (mild, moderate and severe frailty) had significantly poorer HR- QOL eight dimensions which are physical functioning, bodily pain, role limitations due to physical health problems, role limitations due to personal or emotional problems, emotional well-being, social functioning, energy/fatigue, and general health perceptions, comparable to robust and pre-frail elderly even after controlling for possible confounders such as age, functional dependence, education, cognition and depression. Also by Linear Correlation Coefficient there was a significant negative correlation between EFS scores, assessing frailty, and all RAND-36 subscale scores, assessing HR-QOL. These results were consistent with other studies that found that frail subjects reported a worse overall QOL than pre-frail and non-frail subjects as detected by Fried et al(4), Eklund & Wilhelmson (22), Ravaglia et al (45), Avila-Funes et al (46), Masel et al (47), and Kanauchi et al (48) . A study done by Puts et al (49), reported that among a smaller group (n=25) of community-dwelling older adults, those who were frail reported worse health-related quality of life than those who were non-frail. The authors suggested that a larger study could confirm the findings.

On the other hand, Bilotta et al (50), found that frail subjects reported a worse overall QOL using old people quality of life (OPQOL), than pre-frail and non-frail subjects. They found that, five of the seven dimensions of QOL were found to be impaired in frail older participants which are health, independence, home and neighborhood, psychological and emotional well-being, and leisure, activities and religion, only the QOL domains of "social relationships and participation" and "financial circumstances" were not significantly different among the three "frailty status" groups. In our study QOL was assessed by RAND-36 which is a health related QOL questionnaire, while their study assessed QOL by OPQOL which assesses other domains of QOL as psychological well-being, home and neighborhood, and leisure activities and religion, which are the social context of QOL. There is a difference between QOL and health related quality of life (HR-QOL). Because QOL has a highly individualistic, subjective and multidimensional nature, it is difficult to define and measure as mentioned by Guse & Masesar (51). Therefore HR-QOL is used more regularly in research, Smith et al (52). But it is important to assess all domains of QOL and their correlation to frailty.

On the other hand some studies failed to find a strong correlation between frailty and QOL, such as a study by Andrew et al (53) on community dwelling elderly, where a social vulnerability index for living situation, language, social support, social and leisure activities, relationships, and socio-economic status was weakly correlated with a frailty index created by Rockwood & Mitnitski (15).

We can say that frailty, even mild degrees, has a negative effect on health related QOL, but the difference between studies can be due to the difference of the tests and scales used to assess QOL. Other differences might be the participants, either community dwelling elderly, or elderly in elderly caring facilities, along with the sample size. So, further studies are needed with a larger sample size and using scales assessing all the domains of QOL to assess the correlation of frailty to QOL.

Frailty and its correlates: Prevalence of frailty among the studied group as assessed by Edmonton frail scale was mild frailty which represented 15.65% (n=18), moderate frailty was 13.91% (n= 16) and severe frailty was 5.22% (n=6) of the studied sample, that is to say about 34.8% had frailty status.
This high prevalence agrees with a cross-sectional study by Billota (50) where according to the Study of Osteoporotic Fractures (SOF) criteria (30%) were "robust", (37%) were "pre frail" and (33%) were "frail". While in another study by Fried et al (4), 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 that our participants are outpatients; it was found that frail subjects make larger use of health and community services than subjects who are not frail, as shown by Rochat et al (54). Also the low socioeconomic status of the participants, as there is a high prevalence of illiteracy, has been associated with frailty in several cross-sectional studies such as Blaum et al (55), Newman et al (56), Burke et al (57) and Fried et al (58).

It was found that those who were frail were older, had lower education, had more prevalence of stroke, were more functionally dependent in ADL and IADL, had more depressive symptoms by GDS and had more cognitive impairment by MMSE, and the degree of frailty had an inverse relation to function, cognition, and a positive relation with age and depression. This was also found by Linear Correlation Coefficient that showed a significant negative correlation between the EFS scores and ADL, IADL, and MMSE scores and a positive correlation between EFS scores and age and GDS scores. Regarding age, Woods et al (59), found that increased chronological age has been associated with frailty, even after adjustment for medical co morbidities. Regarding prevalence of stroke, it was found to be a risk factor to frailty as detected by Woods et al (59) , while regarding cognition, Central nervous system (CNS) function and cognitive impairment have been hypothesized to be either components of frailty or risk factors as reported by Studenski et al (60). Regarding function, it was found that frailty is predictive of disability, as baseline frailty was strongly associated with ADL disability at 3- year follow-up study by Woods et al (59), while regarding depression, depressive symptoms have been shown to be associated with the frailty syndrome in cross-sectional analyses by Fried et al (4). Another found a strong prospective relationship between depressive symptoms and the

onset of frailty, suggesting that depression may contribute to the etiology of frailty as described by Woods et al (59). Further studies are recommended designed to assess correlates of frailty status, to support our findings.

Regarding BMI, it significantly correlates to the Edmonton frail scale, as about (87%, n=20) of the underweight elderly (n=23) were frail. Underweight elderly show higher EFS scores than normal weight elderly. Weight loss is one of the components of the frailty model proposed by Fried et al (4) and inadequate nutrition is commonly recognized clinically as a marker of frailty. Subjects in the Cardiovascular Health Study (CHS) by Walston et al (61) categorized as frail included both a subset who were underweight and a subset with higher body mass index (BMI) consistent with obesity.

Previous research has shown that frailty is a dynamic state that is responsive to focused interventions as found by Fried et al (23) and Newman et al (62), so, it may be possible to modify some of the factors associated with frailty, including socioeconomic status, strength and exercise tolerance, psychological wellbeing, cognition as well as comorbid illness and disability, and this may have desirable effects on perceived HRQOL. Further studies are needed to support this.

Study limitations included the small sample, only out patients, as well as the cross-sectional approach of our analyses, which is mainly due to lack of cooperation of elderly as the concept of doing scientific research is still not widespread in our community, which decreases the generalization of the current findings.

Conclusion

We can conclude that being frail was strongly associated with diminished health related quality of life. Possible correlates of frailty status were age, low socioeconomic status, low body mass index, functional dependence, depression and cognitive impairment.

Interventions to prevent, delay, or reverse frailty may have a beneficial impact on the health related quality of life in the elderly.

List of abbreviations

ADL = activities of daily living, BMI= body mass index,
EFS = Edmonton frail scale,
GDS = geriatric depression scale,
HRQOL = health related quality of life,
IADL = instrumental activities of daily living,
MMSE = mini mental state examination.

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