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Prevalence of frailty in elderly patients with renal diseases

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Abstract

Background: Frailty, the state of increase vulnerability to physical stressors as a result of progressive and sustained degeneration in multiple physiological systems, is common in those with chronic kidney disease with prevalence more than 60% in dialysis-dependent CKD patients.

Aim: to determine the prevalence of frailty in patient with renal disease.

Methods: A cross section study on 100 participants, males and females ≥ 60 years from patients in Ain Shams University hospital, 50 patients on regular hemodialysis and 50 patients with chronic renal impairment. The estimated glomerular filtration rate (ml/min/1.73m2) determined according to serum creatinine level, with exclusion of GFR ≥ 60. They completed comprehensive geriatrics assessment and modified fried criteria for assessing frailty by; self-reported weight loss, low grip strength, exhaustion, slow gait speed and low physical activity. Multidimensional assessment of fatigue (MAF) was performed.

Results: There were 57 males, 43 females, mean age 66.9, 79% were frail, 65% illiterates, 67% married, 32% smokers, self-reported exhaustion and low activity were statistically significance between CKD and hemodialysis group. Frail participants were divided in to two groups; CKD frail group n=33 and hemodialysis frail group n=46. Only exhaustion criteria had statistically significance difference between CKD frail and hemodialysis frail group, 87% of hemodialysis frail were MAF positive and 81.8% in CKD frail.

Conclusion: Frailty is common in patient with chronic kidney disease and its prevalence increase as the disease advance and become more severe in hemodialysis patients. Self-reported exhaustion was the initial indicator of frailty.

Keywords: Frailty, CKD, hemodialysis, multi-dimensional assessment of fatigue, obesity.

Background

The population aged 65 years old and older is expected to be more than double between 2012 and 2060, with continuing increasing in age related co-morbidities as frailty ***(Aguirre and Villareal, 2015).***

Frailty is common in those with chronic kidney disease (CKD). The prevalence of frailty in the community-dwelling older adult population is reported to be 11%, whereas studies have reported a frailty prevalence of >60% in dialysis dependent CKD patients ***(Bao et al., 2012; Collard et al., 2012).***

Frailty is independently linked with adverse clinical outcomes in all stages of CKD and has been repeatedly shown to be associated with an increased risk of mortality and hospitalization ***(Bao et al., 2012; Collard et al., 2012l Shen et al., 2017).***

Materials and Methods

A cross-sectional study held on 100 participants, Males and Females aging 60 years or more recruited from inpatient ward and outpatient clinics in Ain Shams University Hospital, 50 patients on regular dialysis, 50 patients diagnosed with chronic renal impairment with excluding patients with estimated glomerular filtration rate more than 60 mg/min/1.73m$^{2.}$

All participants were subjected to verbal consent for acceptance to participate in the study and completed a comprehensive geriatric assessment in the form of; history taking (complete medical history), cognitive functional assessment (Mini-mental status examination) **(El-Okl et al., 2002)**. and screening for depression by Geriatric Depression Scale (GDS-15) (**Metwally, A. S.,**

et al., 1998). Functional assessment by (ADL) **(Katz et al., 1963)** and (IADL) **(Lawton and Brody, 1969)**. Assessment of Frailty by modified Fried criteria **(Fried et al., 2001);** self-reported weight loss, low grip strength, exhaustion, slow gait speed and low physical activity. Assessment of gait speed by the Time up and go test **(Podsiadlo and Richardson, 1991)**.

Assessment of fatigue by Multidimensional Assessment of Fatigue (MAF) **(Belza BL, 1995),** assessment of balance by one leg balance test **(Kouvelioti et al., 2015)** , calculation of body mass index. Laboratory data collected from the participants and analyzed in Ain Shams University Hospital central labs (complete blood picture, serum creatinine, calcium, phosphorus, sodium, potassium and glomerular filtration rate by Cockcroft gault equation.

The frail participants were (33 participants) in CKD group and (46 participants) hemodialysis group.

Statistical Analysis: Data were collected, revised, coded and entered to the Statistical Package for Social Science (IBM SPSS) version 20. The quantitative data were presented as mean, standard deviations and ranges when their distribution found parametric and qualitative data were presented as number and percentages.

The comparison between groups regarding qualitative data was done by using **Chi-square test** and/or **Fisher exact test** only when the expected count in any cell was less than 5.

The comparison between two independent groups with quantitative data and parametric distribution was done using **Independent t-test** while data with non-parametric distribution was compared using **Mann-Whitney test,** and **Generalized linear regression** was done to assess predictors, among the assessment tools of frailty domains**.**

The confidence interval was set to 95% and the margin of error accepted was set to 5%. The p-value was considered significant as the following:
P > 0.05: Non-significant, P < 0.05: Significant, P < 0.01: Highly significant

Results:

The study sample consisted of 100 elderly participants; 50 participants were on hemodialysis and the other half had chronic renal disease. The mean age was 66.89±6.41. It was 68.20±7.02 in CKD group which was higher than the mean age of the hemodialysis group which was 65.58±5.49 with statistically significant difference found between them. 57% of our participants were males, 43% were females. Most of the study subject was illiterates (65%). 67% of our participants were married.67% were nonsmokers, 1% were ex-smoker. **(Table 1)**

The prevalence of frailty was 79% of all studied sample. It was 92% in hemodialysis group and 66% of CKD group. 21 % of study population was pre frail. Mean frailty score in study population was 3.65±1.10 which was more in hemodialysis group (4.02 ± 0.84) than in CKD group (3.28 ± 1.21).

As regard frailty criteria, the mean score of exhaustion criteria and low physical activity were more in hemodialysis group than in CKD group which had high statistically significance difference found between them. It's found that 20% of cases had significant weight loss which was more prevalent in hemodialysis group, 97% of cases had slow walking speed and weak grip strength which was more prevalent in hemodialysis group. **(Table 2)**

Illustrating frailty criteria between CKD frail group (33 participants) and hemodialysis frail group (46 participants). In hemodialysis frail group 26.1% had significant weight loss, 91.3% were physically inactive and all the participants had slow gait speed and weak hand strength.

In CKD frail group 24.2% has significant weight loss, 90.9% were physically inactive 97% had slow gait speed and all participants had weak hand strength. Mean score of exhaustion criteria was more in hemodialysis frail group than in CKD group which had statistically significant difference between both groups **.(Table 3)**

Lab difference between CKD frail and hemodialysis frail group was as following: mean hemoglobin level and mean serum Ca were more in CKD frail group than in hemodialysis frail group. While mean serum phosphorous level and serum potassium level were more in hemodialysis frail group.

For assessment of fatigue by using multidimensional assessment of fatigue .It is found that 87% of hemodialysis frail participants were MAF positive, while it was 81.8% in CKD frail participants.**(Table 4)**

For assessing predictors and protectors of frailty; logistic regression analysis was done and showed that age > 65, widows, osteoporosis, MMSE ≤ 27, depression, dependence in ADL, exhaustion, slow speed, abnormal TUG, low GFR, Fatigue) all of those are predictors of frailty. While DM, high education, independence in ADL and IADL, and normal balance are protectors from frailty. **(Table 5)**

Table 1. ***Comparison between CKD & hemodialysis group regarding Demographic data***

		Total	CKD	Hemodialysis	Test value	P-value	Sig.
		No. = 100	No. = 50	No. = 50			
Age	Mean ± SD	66.89 ± 6.41	68.20 ± 7.02	65.58 ± 5.49	2.079•	0.040	S
Gender	Male	57 (57.0%)	33 (66.0%)	24 (48.0%)	3.305*	0.069	NS
	Female	43 (43.0%)	17 (34.0%)	26 (52.0%)			
Education	Illiterate	65 (65.0%)	30 (60.0%)	35 (70.0%)	10.940*	0.027	S
	Primary school	2 (2.0%)	1(2.0%)	1 (2.0%)			
	Prep school	5 (5.0%)	0 (0.0%)	5 (10.0%)			
	Diploma	10 (10.0%)	5 (10.0%)	5 (10.0%)			
	Highly educated	18 (18.0%)	14 (28.0%)	4 (8.0%)			
Marital status	Married	67 (67.0%)	32 (64.0%)	35 (70.0%)	0.407*	0.523	NS
Special habits	Smoker	32 (32.0%)	20 (40.0%)	12 (24.0%)	4.209*	0.122	NS
	Ex-smoker	1 (1.0%)	1 (2.0%)	0 (0.0%)			

P-value >0.05: Non significant (NS); P-value <0.05: Significant (S); P-value< 0.01: highly significant (HS) *:Chi-square test; ‡: Mann Whitney test.

Table 2: Comparison between CKD group and hemodialysis group regarding frailty criteria

Frailty criteria		Total	CKD	Hemodialysis	Test value	P-value	Sig.
		No. = 100	No. = 50	No. = 50			
A\ weigh loss							
Un intended weight loss	Positive	20 (20.0%)	8 (16.0%)	12 (24.0%)			
BMI	Mean ± SD	27.70 ± 6.21	26.975.29	28.43 ± 7.00	-1.176•	0.243	NS
B\Exhaustion criteria							
Q1	Mean ± SD	1.50 ± 1.11	1.08 ± 1.03	1.92 ± 1.05	-3.844‡	0.000	HS
Q2	Mean ± SD	1.55 ± 1.10	1.12 ± 1.06	1.98 ± 0.96	-3.934‡	0.000	HS
C\Slow speed	Positive	97 (97.0%)	47 (94.0%)	50 (100.0%)	3.093*	0.079	NS
D\weakness	Positive	97 (97.0%)	48 (96.0%)	49 (98.0%)	0.344*	0.558	NS
E/low activity	Positive	72 (72.0%)	30 (60.0%)	42 (84.0%)	7.143*	0.008	HS
SCORE	Mean ± SD	3.65 ± 1.10	3.28 ± 1.21	4.02 ± 0.84	-3.138‡	0.002	HS
Frail	Pre frail	21 (21.0%)	17 (34.0%)	4 (8.0%)	10.187*	0.001	HS
	Frail	79 (79.0%)	33 (66.0%)	46 (92.0%)			

P-value >0.05: Non-significant (NS); P-value <0.05: Significant (S); P-value< 0.01: highly significant (HS) *:Chi-square test; ‡: Mann Whitney test.

Q1 how often in the last week did you feel that everything you did was an effort.

Q2 how often in the last week did you feel that you could not get out.

Table (3): ***Comparison between frail CKD & frail hemodialysis regarding frailty criteria***

Frailty criteria		CKD frail	Hemodialysis frail	Test value	P-value	Sig.
		No. = 33	No. = 46			
A\ weigh loss						
Un intended weight loss	Positive	8 (24.2%)	12 (26.1%)			
BMI	Mean ± SD	27.08 ± 6.04	28.87 ± 7.12	-1.176	0.243	NS
B\Exhaustion criteria						
Q1	Mean ± SD	1.64 ± 0.82	2.00 ± 0.99	-1.726	0.088	NS
Q2	Mean ± SD	1.70 ± 0.85	2.09 ± 0.84	-2.030	0.046	S
C\Slow speed	Positive	32 (97.0%)	46 (100.0%)	1.412	0.235	NS
D\weakness	Positive	33 (100.0%)	46 (100.0%)	–	–	–
E/low activity	Positive	30 (90.9%)	42 (91.3%)	0.004	0.951	NS
Score	Mean±SD	4.06±0.56	4.20±0.62	1.147	0.233	NS

P-value >0.05: Non-significant (NS); P-value <0.05: Significant (S); P-value< 0.01: highly significant (HS) *:Chi-square test; ‡: Mann Whitney test.

Q1 how often in the last week did you feel that everything you did was an effort.

Q2 how often in the last week did you feel that you could not get out.

Table (4): ***Comparison between CKD frail and hemodialysis frail regarding lab findings and multi-dimensional assessment of fatigue***

Labs		CKD frail	Hemodialysis frail	Test value	P-value	Sig.
		No. = 33	No. = 46			
HB	Mean ± SD	9.71 ± 1.37	9.20 ± 1.29	1.666	0.100	NS
ser Ca	Mean ± SD	8.72 ± 0.59	8.36 ± 0.81	2.182	0.032	S
serPo4	Mean ± SD	4.04 ± 0.88	4.95 ± 1.10	-3.914	0.000	HS
ser Na	Mean ± SD	136.76 ± 6.30	136.30 ± 7.39	0.285	0.776	NS
ser K	Mean ± SD	4.55 ± 0.66	4.56 ± 0.79	-0.065	0.948	NS
SER Cr	Mean ± SD	2.90 ± 1.08	5.53 ± 1.52	-8.514	0.000	HS
GFR	G3B	11 (33.3%)	0 (0.0%)	79.000	0.000	HS
	G4	22 (66.7%)	0 (0.0%)			
	G5	0 (0.0%)	46 (100.0%)			
MAF	Negative	6 (18.2%)	6 (13.0%)	0.394	0.530	NS
	Positive	27 (81.8%)	40 (87.0%)			

P-value >0.05: Non significant (NS); P-value <0.05: Significant (S); P-value< 0.01: highly significant (HS) *:Chi-square test; ‡: Mann Whitney test.

Table (5): ***Logistic regression analysis for the predictors of frail cases in all CKD cases***

	B	S.E.	Wald	P-value	Odds ratio (OR)	95% C.I. for OR	
						Lower	Upper
Age >65	1.138	0.560	4.134	0.042	3.120	1.042	9.343
Marital status	1.814	0.778	5.433	0.020	6.135	1.335	28.205
DM	-1.355	0.665	4.151	0.042	0.258	0.070	0.950
OP	1.914	1.057	3.280	0.070	6.780	0.854	53.803
MMSE <= 27	2.205	0.548	16.201	0.000	9.073	3.100	26.553
Orientation <= 9	2.022	0.777	6.773	0.009	7.557	1.648	34.660
Reading	-1.739	0.526	10.922	0.001	0.176	0.063	0.493
Writing	-1.739	0.526	10.922	0.001	0.176	0.063	0.493
Drawing	-1.726	0.545	10.050	0.002	0.178	0.061	0.517
GDS (Depression)	0.985	0.502	3.848	0.050	2.678	1.001	7.167
ADL≤5	2.559	1.050	5.934	0.015	12.917	1.649	101.193
Transportation	-2.818	1.049	7.213	0.007	0.060	0.008	0.467
Exhaustion criteria	4.183	0.817	26.226	0.000	65.550	13.223	324.948
Slow speed	2.105	1.251	2.832	0.092	8.211	0.707	95.362
TUGO Score	1.611	0.505	10.196	0.001	5.008	1.863	13.464
Balance Score	-2.006	0.555	13.045	0.000	0.135	0.045	0.400
HB <= 10.3	2.287	0.558	16.777	0.000	9.844	3.296	29.403
SER Cr >3.7	1.495	0.561	7.108	0.008	4.461	1.486	13.390
GFR	1.106	0.332	11.080	0.001	3.023	1.576	5.798
MAF	4.716	1.072	19.365	0.000	111.667	13.671	912.104

P-value >0.05: Non significant (NS); P-value <0.05: Significant (S); P-value< 0.01: highly significant (HS) *:Chi-square test; ‡: Mann Whitney

DISCUSSION

The prevalence of frailty of the current study was 79%. It was more prevalent in hemodialysis group. This outcome is higher than that reported by ***Song et al. (2020).***

Johanson et al. (2007) showed that the prevalence of frailty in participants aging from 60 to 70 years was (74.2%) from 70 to 80 years was (78.1%), and more than 80 year was (78.8%). This result is near to ours in age group more than 60 years old.

As regard frailty criteria, the mean exhaustion criteria and low activity were more in hemodialysis group than in CKD group which had high statistically significance difference found between them. It's found that 20% of cases had significant weight loss which was more prevalent in hemodialysis group, 97% of cases had slow walking speed and weak grip strength which was more prevalent in hemodialysis group.

In hemodialysis frail group 26% had significant weight loss, 91.3% were physically inactive and all the participants had slow gait speed and weak hand strength.

In CKD frail group 24.2% has significant weight loss, 90.9% were physically inactive 97% had slow gait speed and all participants had weak hand strength. Mean score of exhaustion criteria was more in hemodialysis frail group than in CKD group.

It comes with ***Roshanravan et al. (2012)*** in an observational study held on 336 participants with CKD completed fried criteria for frailty showed that the most common frailty component in individuals with CKD were low physical activity, exhaustion and slow gait speed.

Our results showed that there were positive correlation between age as in ***song et al. (2020); Mansur et al. (2007),*** depression as with ***(Andersen et al., 2005; Laursen et al., 2007; Feng et al., 2014),*** Exhaustion criteria which comes with ***(Roshanravan et al., 2012),*** ser (k), ser (Cr) which comes with ***(Wilhem-leen et al., 2009)*** and frailty score.

While there was inverse correlation between MMSE; orientation, recall and Hb level which comes with ***(Dowling, 2007; Chaves et al., 2002)*** and frailty. Also there was highly statistically significance between frail score and educational level, MMSE (reading, writing, drawing) While there was statistically significance between frail score and special habits which comes with ***(Takeuchi et al., 2018),*** DM which comes with ***(Mousavi et al., 2012),*** HF which comes with ***(Sarnak et al., 2003).*** Also there was highly statistically significance between frail score and ADL dependency regarding bathing, Dressing, transferring and transportation from IADL, while there was statistically significance between frail score and toileting which comes with ***(xue, 2011).*** Transportation only from IADL had highly statistically significance.

There was high statistically significance relation between frail score and TUG, and balance which comes with ***(Mulasso et al., 2017),*** GFR ***(Wilhem-leen et al., 2009),*** MAF which comes with ***(McCann et al., 2000);*** While there was statistically significance regarding BMI a u shaped relation which is supported by ***(Hubbard et al., 2010).***

Logistic regression showed that (age > 65, marital status "widows, osteoporosis, MMSE ≤ 27, orientation ≤ 9, depression, ADL≤5,exhaustion criteria, slow speed, TUG "Independent & dependent" , Hb ≤ 10.3, serum Cr > 3.7, low GFR, MAF) all of those are predictors of frailty; while ability of reading, writing, drawing, ability of transport, and normal balance are protectors from frailty.

Conclusion

Prevalence of frailty was 79% in the studied sample. Frailty is common in patient with chronic kidney disease and its prevalence increase as the disease advance and become more severe in hemodialysis patients. Self-reported exhaustion was the initial indicator of frailty between CKD frail and hemodialysis frail group. Increasing age and age related cognitive impairment, depression, anemia, low GFR and having multi co-morbidities had a strong relation with frailty in patients with CKD.

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