Frailty prevalence and correlated risk in older diabetic patients of a diabetes clinic

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❖ **Background:**

Frailty is characterized by multi-system decline and vulnerability to adverse outcomes caused by relatively minor stresses. Older patients with diabetic mellitus (DM) were likely to develop frailty leading to higher mortality risk. The goal of this study was to investigate prevalence of frailty and its association with clinical manifestations, functional ability, depression, and cognitive impairment among 65-year and older type 2 DM patients.

❖ **Methods:**

A total of 248 patients with type 2 diabetes were selected by random systematic sampling from a diabetic clinic located at Yilan County, Taiwan between August, 2015 and April, 2016. Participants consisted of 50.0% male with age 73.9±5.9 years (mean±SD), body mass index 25.4±3.8 kg/m², DM duration 15.2±9.0 years, glycosylated hemoglobin 7.1±1.1%, type of medication use 3.1±1.5, and number of self-reported clinical manifestations 3.7±1.4; including hypertension (67.3%), hyperlipidemia (75.4%), diabetic nephropathy (52.0%), retinopathy (22.6%), neuropathy (9.3%), and stroke (3.6%). The self-reported frequency of fall was 0.6±1.2, hypoglycemia (<70 mg/dl) was 2.3±5.7, and hyperglycemia (>300 mg/dl) was 2.1±8.6 in the past year (Table 1). Fried et al.'s phenotype model - unintentional weight loss, self-reported exhaustion, low physical activity, slow walking speed, and muscle weakness (grip strength) was adopted to set our five criteria based on participants' physical characteristics (height, body mass, and body mass index) because of smaller-size Chinese and different physical activity habit, as such a cutoff of ≥3 kg or ≥5% was used for weight loss in the past year and the Chinese version International Physical Activity Questionnaire was used for assessment of activity energy expenditure in the past week. Frailty was defined by the presence of three or more of the criteria. Functional ability was evaluated by the Activities of Daily Living (ADL) scale and Instrumental ADL (IADL) scale. Depression was evaluated by the Taiwan Geriatric Depression Scale (TGDS) and cognitive impairment by Mini-Mental State Examination (MMSE). Demographic and clinical data was obtained from medical records. The independent-samples t-test or nonparametric Mann-Whitney U-test was used to examine difference in means and χ^2 test in frequency between two variables. Multivariate logistic regression was used to identify the correlates of frailty.

❖ **Results:**

The frailty prevalent rate was 9.3% among all participants, 9.6% among males, and 8.9% among females. The age-specific frailty prevalent rate was 5.8%, 12.2%, 23.1%, for 65-74.9, 75-84.9, and ≥85 years respectively (Table 2 & 3). Compared to patients without frailty, patients with frailty had significantly ($p<0.05$) higher percentage of stroke (13.0% vs. 2.7%), diabetic nephropathy (78.3% vs. 49.3%) and fall (1.1±1.2 vs. 0.5±1.2), lower physical function (≥1 IADL task: 39.1% vs. 14.7%), higher depression level (5.2±3.5 vs. 2.0±2.4), and greater cognitive impairment (22.1±4.0 vs. 25.5±4.3) (Table1). Independent correlates of frailty among participants were age≥85 years (adjusted odd ratio, OR, 6.42; 95% CI, 1.21-34.1; $p=0.029$), diabetic nephropathy (adjusted OR, 3.98; 95% CI, 1.10-14.30; $p=0.035$), higher depression level (adjusted OR, 1.48; 95% CI, 1.24-1.76; $p<0.001$), and longer diabetes duration (adjusted OR, 1.06; 95% CI, 1.01-1.12; $p=0.028$).

❖ **Conclusions:**

About one-tenth of the diabetic patients studied, irrespective of gender, were frail. Frailty increased with advancing age - approximately one-fourth by ≥85 years old. Besides old age and longer DM duration, having diabetic nephropathy and depression symptoms increased the frailty risk. Early detection by routine screening for sign of depression or chronic kidney disease is strongly recommended in diabetic care for the prevention or delay of frailty.

❖ **Reference:**

Fried, L. P., Tangen, C. M., Walston, J., Newman, A. B., Hirsch, C., Gottdiener, J., Burke, G. (2001). Frailty in older adults: evidence for a phenotype. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, 56(3), M146-M157.

Table 1. Characteristics of the study participants N=248

Variables	Total N =248 N (%) / Mean ± SD	Non-frail N = 225 (90.7%) N (%) / Mean ± SD	Frail N = 23 (9.3%) N (%) / Mean ± SD	p value
Age	73.9 ± 5.9	73.6 ± 5.8	77.0 ± 6.1	0.013
65-74.9	137 (55.2%)	129 (57.3%)	8 (34.8%)	0.053
75.0-84.9	98 (39.5%)	86 (38.2%)	12 (52.2%)	
≥ 85	13 (5.2%)	10 (4.4%)	3 (13.0%)	
DM duration	15.2 ± 9.0	14.7 ± 8.6	19.7 ± 11.5	0.056
Sex				0.827
Male	124 (50.0%)	112 (49.8%)	12 (52.2%)	
Female	124 (50.0%)	113 (50.2%)	11 (47.8%)	
Education status				0.227
Illiterate	60 (24.2%)	52(23.1%)	8(34.8%)	
Primary school	109 (44.0%)	100(44.4%)	9(39.1%)	
Junior high school	22 (8.9%)	19(8.4%)	3(13.0%)	
Senior high school	37 (14.9%)	36(16.0%)	1(4.3%)	
College	17 (6.9%)	16(7.1%)	1(4.3%)	
Graduated school	3 (1.2%)	2(0.9%)	1(4.3%)	
Marital status				0.164
Single	1 (0.4%)	0(0%)	1(4.3%)	
Married	180 (72.6%)	163(72.4%)	17(73.9%)	
Divorce	1 (0.4%)	1(0.4%)	0(0.0%)	
Widow	66 (26.6%)	61(27.1%)	5(21.7%)	
Living status				0.704
Living alone	20 (8.1%)	19(8.4%)	1(4.3%)	
Living with family	228 (91.9%)	206(91.6%)	22(95.7%)	
Clinical parameters				
A1C	7.1 ± 1.1	7.1 ± 1.1	7.2 ± 0.8	0.243
A1C<8%	211(85.1%)	192(85.3%)	19(82.6%)	0.758
A1C≥8%	37(14.9%)	33(14.7%)	4(17.4%)	
Total cholesterol (N=246)	156.7 ± 29.0	156.1 ± 27.8(N=223)	162.0 ± 39.5(N=23)	0.933
HDL (N=246)	52.1 ± 15.8	52.3 ± 16.2	50.2 ± 10.2	0.775
LDL (N=247)	77.9 ± 22.9	78.0 ± 22.1	77.4 ± 29.6	0.363
Triglycerides (N=246)	139.0 ± 89.5	138.5 ± 91.6	144.4 ± 67.4	0.165
Creatinine (N = 246)	1.1 ± 0.4	1.1 ± 0.8	1.5 ± 0.9	0.007
ACR (N=233)	104.3 ± 277.5	90.1 ± 242.6	263.9 ± 516.8	0.165
<30	148 (63.5%)	137(64.0%)	11(57.9%)	0.154
30-300	64 (27.5%)	60(28.0%)	4(21.1%)	
>300	21 (9.0%)	17(7.9%)	4(21.1%)	
eGFR (N=246)	69.4 ± 20.5	70.8 ± 19.6	56.8 ± 24.9	0.005
<60	80 (32.5%)	67(30.0%)	13(56.5%)	0.010
≥60	166 (67.5%)	156(70.0%)	10(43.5%)	
BMI	25.4 ± 3.8	25.2 ± 3.6	26.7 ± 5.4	0.268
Medical history				
Hypertension	167 (67.3%)	152(67.6%)	15(65.2%)	0.820
Cardiovascular diseases	63 (25.4%)	57(25.3%)	6(26.1%)	0.937
Hyperlipidemia	187 (75.4%)	167 (74.2%)	20 (87.0%)	0.177
Stroke	9 (3.6%)	6 (2.7%)	3 (13.0%)	0.041
Diabetic nephropathy	129 (52.0%)	111 (49.3%)	18 (78.3%)	0.008
Retinopathy	56 (22.6%)	50(77.8%)	6 (73.9%)	0.673
Neuropathy	23 (9.3%)	23(10.2%)	0 (0%)	0.143
Average disease number	3.7 ± 1.4	2.8 ± 1.4	3.2 ± 1.2	0.080
Types of medicine	3.1 ± 1.6	3.1 ± 1.5	3.7 ± 1.7	0.109
Frequency of fall	0.6 ± 1.2	0.5 ± 1.2	1.1 ± 1.2	0.001
Frequency of hypoglycemia	3.2 ± 6.0	3.1 ± 5.8	4.0 ± 7.6	0.499
Frequency of hyperglycemia (>300 mg/dl)	2.1 ± 8.6	2.1 ± 8.9	2.2 ± 4.7	0.042
Functional assessment				
ADL	98.6 ± 4.7	98.9 ± 2.8	95.4 ± 12.3	0.198
≥1 IADL task disability	42(16.9%)	33(14.7%)	9 (39.1%)	0.003
TGDS	2.3 ± 2.6	2.0 ± 2.4	5.2 ± 3.5	<0.001
MMSE	25.2 ± 4.4	25.5 ± 4.3	22.1 ± 4.0	<0.001

Table2. Prevalence of frailty

Age group (n)	Overall (N=248) % Frail	Men (N=125) % Frail	Women (N=123) % Frail
65-74.9 (n=137)	5.8%	4.3%	7.5%
75-84.9 (n=98)	12.2%	12.2%	12.2%
≥85 (n=13)	23.1%	50.0%	0.0%
Total	9.3%	9.6%	8.9%

※Frailty was defined by the presence of three or more of the criteria.

Table3. Prevalence of frailty phenotype components in percentage

	Total (N=248)	Men (N=125)	Women (N=123)
Frequency of frailty components	%	%	%
Grip strength (kg)	19.8%	19.2%	20.3%
Slow walk (s)	20.6%	20.0%	21.1%
Weight loss	10.5%	11.2%	9.8%
Exhaustion	19.8%	17.6%	22.0%
Low activity (kcal)	20.2%	20.0%	20.3%
Number of frailty components present			
0	44.8%	45.6%	43.9%
1	30.6%	30.4%	30.9%
2	15.3%	14.4%	16.3%
3	8.1%	8.8%	7.3%
4	0.8%	0.8 %	0.8%
5	0.4%	0.0%	0.8%