Contents lists available at ScienceDirect

Archives of Gerontology and Geriatrics

journal homepage: www.elsevier.com/locate/archger

Depressive symptoms and nutritional status in the frail older adults

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ABSTRACT

Objectives: The purpose of this study is to determine the relationship between depressive symptoms and nutritional status in the frail older adults.
Methods: This study uses a cross-sectional, descriptive, and correlational design. A questionnaire was used to collect demographic data, and the Taiwan International Physical Activity Questionnaire Form Geriatric Depression Scale-Short Form Charlson Comorbidity Index, and Mini-Nutritional Assessment Short-Form were used to measure depression and nutritional status, respectively. Data were analyzed by independent-t tests, chi-square tests, spearman correlations, and multiple linear regressions.
Results: Of the total of 94 frail older adults, 17 (18.09%) had depressive symptoms (GDS $\geq$ 5). The average MNA-SF score was 11.38 (SD = 2.45), 31 (32.98%) participants had a risk of malnutrition and 12 (12.77%) were malnourished. Participants' reports of dissatisfaction with their lives (72.1%) and feeling terrible about their lives (58.14%) were associated with a risk of malnutrition. Elderly age, multiple comorbidities, and high level of depressive symptoms were at increased risk of malnutrition.
Conclusion: When clinicians are faced with a high-risk group, such as elderly patients with multiple comorbidities and depressive symptoms, they should perform an immediate assessment of nutritional status. If a risk of malnutrition is found, adequate nutrition and health care should be provided.

What is already known about this topic?

- Higher levels of frailty are associated with more depressive symptoms.
- Frail older adults have a higher risk of malnutrition.

What this paper adds

- Participants' reports of dissatisfaction with their lives (72.1%) and feeling terrible about their lives (58.14%) were associated with a risk of malnutrition.
- Depression is an important risk factor for malnutrition among frail older adults.
- In this Taiwanese sample, of the 94 frail older adults, almost 20% had depressive symptoms, and about 45% were at risk for malnutrition and malnourishment.

Implications of this paper

- Clinicians should understand the importance of depression and nutrition status in frail older adults.
- When clinicians are faced with a high-risk group, such as elderly patients with multiple comorbidities and depressive symptoms, they should assess nutritional status.

1. Introduction

As advances in medical technology boost average life expectancy for people in Taiwan, the percentage of the aging population has grown from 10.74% in 2010 to 14.5% in 2018. The percentage of citizens aged 65 or older in Taiwan's population is expected to increase to 41.2% by 2065, making Taiwan an aging society (Council for Economic Planning & Development, 2018; Ministry of the Interior, 2017).

Frailty is a complicated health issue for the elderly and involves

multiple factors. It is also a sign of functional decline and dysfunction (Fried et al., 2001; Lang, Michel, & Zekry, 2009). According to previous studies, the prevalence of pre-frail and frailty in communities of elderly persons were 53% and 12.2%, respectively (Curcio, Henao, & Gomez, 2014). For the elderly in Taiwan, the prevalence of pre-frail and frailty in communities of elderly persons were 40% and 4.9%, respectively (Yan & Xie, 2013). Hsu et al. (2017) found that elderly women were more likely to suffer from frailty. Further, higher levels of frailty predicted more depressive symptoms. Researchers also have found that frail adults have a higher risk of malnutrition (Inoue & Kato, 2007).

Lu et al. (2010) noted that frail subjects had poorer self-rated health, memory, nutrition, and depressive symptoms than did non-frail subjects. Depression is a common cause of malnutrition, due to weight loss (Bailly, Maitre, & Van Wymelbeke, 2015; Morley & Kraenzle, 1994). Saka et al. (2009) reported that depressive symptoms and multiple co-morbidities were strongly associated with increased poor nutritional status. Feldblum et al. (2007) found a significant correlation between decreased cognitive ability, limited physical ability, chewing problems, malnutrition, and more depressive symptoms. Kaburagi et al. (2011) noted that grip strength, speed of walking, marital status, and level of depression were predictors of Mini-Nutritional Assessment scores.

The concept of frailty is rather new in Taiwan, and most of the previous studies considered frailty only in terms of a single problem, such as depression or malnutrition. The association between depressive symptoms and nutritional status was seldom addressed. Therefore, the aim of this study is to explore the association between the two issues and to identify the important factors associated with risk of malnutrition among the frail elderly.

2. Data and methods

2.1. Study design

A cross-sectional study was used to address the aims of the study: (1) to describe the basic features of frail older adults in an outpatient setting; (2) to explore the association between demographic characteristics, chronic diseases, depressive symptom, and nutritional status; and (3) to identify the important factors associated with risk of malnutrition. Demographic characteristics, chronic diseases, and depressive symptoms are the independent variables, while nutritional status is the dependent variable.

2.2. Recruitment and participants

The participants in this study were recruited through convenience sampling from the neurology and geriatrics outpatient department at in a regional teaching hospital in northern Taiwan. Participants belong to the same group as those in the study of Chen, Tung, Tung, and Denq (2017). Inclusion criteria were: (1) aged 65 and over; (2) conscious literate, and able to communicate in Mandarin Chinese or Taiwanese; and (3) diagnosed as frail. Exclusion criteria were: (1) diagnosed as mentally or intellectually disabled; (2) having vision or hearing difficulties in terms of following orders; or (3) having a physical disability due to trauma surgery in the prior three months.

2.3. Measurements

A structured questionnaire was used to collect data, including demographic variables, and to assess the frailty of the participants. Other tools in the study included the Taiwan International Physical Activity Questionnaire Form (Taiwan IPAQ Elderly), Geriatric Depression Scale-Short Form (GDS-SF), Charlson Comorbidity Index (CCI), and Mini-Nutritional Assessment-Short Form (MNA-SF).

2.3.1. Measurement of frailty

Frailty was defined as the patient's having three of the five following criteria (Drey, Pfeifer, Sieber, & Bauer, 2011; Fried et al., 2001; Wu et al., 2011): (1) weight loss (unintentional weight loss of 4.5 kg or 5% in one year); (2) muscle weakness (adjusted for gender and body mass index); (3) exhaustion (based on the score on the Center for Epidemiologic Studies Depression Scale, including two questions regarding whether respondents feel a lack of energy or fatigue, self-reported, three times a week); (4) slow gait speed (time spent walking 4.57 m > 7 s, adjusted for gender and height); and (5) low physical activity (based on the score of Taiwan International Physical Activity Questionnaire-Short Form for the elderly (Taiwan IPAQ,-Elderly), which measures energy consumed every week; men who consume fewer than 642 calories and women who consume fewer than 396 calories are determined to have low physical activity).

2.3.2. International physical activity questionnaire (IPAQ)

The short version of the IPAQ was translated from the full version by Liou (2004), with acceptable reliability (0.67) and validity (0.99), when compared English to the Chinese version (Liou, Jwo, Yao, Chiang, & Huang, 2008; Liou, 2004). The IPAQ measures daily physical activity, chores, sleep, recreational activity, and exercise. The level of physical activity was ascertained by asking the participants about their activities, including vigorous and moderate activities in the prior seven days and the time spent on them (Liou, 2004).

2.3.3. Chinese geriatric depression scale-short form (GDS-SF)

The GDS-SF was developed by Yesavage et al. (1982) and later revised by Sheikh and Yesavage (1986) to 15 questions from the original 30 questions. The scale contains yes/no questions to assess emotion, cognition, and behaviour as clinical screening criteria for depression. The total score is 15, with 0–4 as indicating normal, 5–9 as indicating possible depressive symptoms, and 10–15 as indicating depression. A higher score means worse depression. The Cronbach's alpha was 0.72. The sensitivity rate among the elderly (aged 60 years and older) was 97%, and the specificity rate was 54% (Almeida & Almeida, 1999). The scale is now widely used in communities in Taiwan, long-term care facilities, and acute medical institutions (Cheng, Hwang, Lee, & Liao, 2016).

2.3.4. Charlson Comorbidity Index (CCI)

The CCI was developed by Charlson, Pompei, Ales, and MacKenzie (1987) to assess mortality rates. It contains 19 comorbidities, and the scores for each comorbid disease range from 0 to 6. A higher score indicates poorer health conditions and increased mortality rates.

2.3.5. Mini-Nutritional Assessment Short-Form (MNA-SF)

The MNA, developed by Guigoz, Vellas, and Garry (1996), was revised to the MNA-SF by Rubenstein, Harker, Salva, Guigoz, and Vellas (2001), who used the scale to assess the nutritional status of elderly patients. The simplified version has six questions with a total score of 14, with 0–7 classified as malnutrition, 8–11 as at risk of malnutrition, and 12–14 as normal nutritional status. Compared with the MNA, the sensitivity and specificity of this version are 97.9% and 100%, respectively.

2.4. Statistical analysis

Data analyses were performed using SPSS, version 22. The descriptive statistics included frequencies, percentages, means, and standard deviations. Independent *t*-tests, and chi-square tests were performed to analyze the basic characteristics and different nutritional statuses of frail older adults. Spearman correlation coefficient tests and regression analysis was then performed to determine the factors that are associated with the nutritional status of frail older adults.

Table 1
Demographics as related to nutritional status.

Variable	Nutritional status		p
	MNA-SF score (12–14) n (%)	MNA-SF score (0–11) n (%)	
Age, Mean (SD)	75.12 (4.81)	79.67 (7.40)	0.001***
Sex			0.098
Male	27 (52.94)	15 (34.88)	
Female	24 (47.06)	28 (65.12)	
Education			0.710
Junior high school	35 (68.63)	31 (72.09)	
Senior high school	16 (31.37)	12 (27.91)	
Profession			0.684
No	47 (92.16)	41 (95.35)	
Yes	4 (7.84)	2 (4.65)	
Marital Status			0.750
Married	49 (96.08)	36 (83.72)	
Other	2 (3.92)	7 (16.28)	
Status of residence			1.000
Solitary	1 (1.96)	1 (2.33)	
Others	50 (98.04)	42 (97.67)	
Economic			0.109
Salary or pension	45 (88.24)	32 (74.42)	
Others	6 (11.76)	11 (25.58)	
Smoking			1.000
No	49 (96.08)	42 (97.67)	
Yes	2 (3.92)	1 (2.33)	
CCI score, Mean (SD)	1.1 (1.26)	1.8 (1.70)	0.020*
GDS score, Mean (SD)	1.4 (2.70)	3 (3.72)	0.020*

$*p < 0.05. ** p < 0.01. *** p < 0.001.$

3. Results

3.1. Demographics

For the 94 participants, the mean age was 77.20 (SD = 6.51). Among the participants, 42 (44.7%) were men and 52 (55.3%) were women. The mean CCI score was 1.45, the mean score of the GDS-SF was 2.15 (SD = 3.29), and 77 (81.91%) reported having no depressive symptoms, while 17 (18.9%) reported symptoms indicative of their being likely to be depressed. As for nutritional status assessed with the MNA-SF, the mean score was 11.38 (SD = 2.45), and 51 (51.26%) were classified as having normal nutritional status, 31 (32.98%) were at risk of malnutrition, and 12 (12.77%) were malnourished. The results of the IPAQ showed that 29 (30.85%) had sufficient physical ability, and 65 (69.15%) had limited physical ability.

3.2. Demographics and nutritional status

The results for the 94 frail older adults showed that age ($p < 0.001$), and scores on the CCI score ($p < 0.020$) and GDS-SF ($p < 0.020$) were significantly correlated with nutritional status (Table 1).

3.3. Factors associated with nutritional status of frail older adults

The results of Spearman correlations showed negative correlations of age ($r = -0.4, p < 0.01$), CCI score ($r = -0.35, p < 0.01$) and GDS-SF score ($r = -0.37, p < 0.01$) with MNA-SF score among the frail older adults (Table 2). Multiple linear regression was employed to further understand the correlation between nutritional status and other variables of the frail older adults. Based on the differences of demographic, the significant variables associated with nutritional status included age, CCI score, and GDS-SF score. The results of the multiple linear regression analysis after adjusting age, CCI scores, GDS-SF showed that age ($p < 0.001$), and GDS-SF score ($p < 0.007$) were significantly correlated with MNA-SF score in the frail older adults

Table 2
Spearman correlations between variables and nutritional status ($N = 94$).

Variable	Age	CCI score	GDS-SF score	MNA-SF score
Age	–			
CCI score	0.308**	–		
GDS-SF score	0.087**	0.314**	–	
MNA-SF score	−0.402**	−0.353**	−0.368**	–

$** \ p < 0.01.$

Table 3
Multiple linear regression for factors associated with risk of malnutrition ($N = 94$).

	β	R	R^2	Adj. R^2	SD	t-value	p
		0.552	0.305	0.282			
Age	−0.143				0.035	−4.030	0.001***
CCI score	−0.297				0.157	−1.894	0.061
GDS-SF score	−0.189				0.068	−2.768	0.007**

$*p < 0.05. ** p < 0.01. *** p < 0.001.$
Adjusted for age, CCI score, GDS-SF score.

(Table 3).

3.4. GDS-SF as related to risk of malnutrition

The results of the chi-square test showed that risk of malnutrition (MNA-SF 0–11) was significantly correlated with GDS-SF 1 ($p < 0.004$) and with GDS-SF 11 ($p < 0.010$). Participants' reports of dissatisfaction with their lives (72.1%) and feeling terrible about their lives (58.14%) were associated with a risk of malnutrition (Table 4).

4. Discussion

4.1. Level of depression and nutritional status

The mean score for the GDS-SF was 2.15, and 18.09% of the participants had depressive symptoms, while 81.91% did not. The percentage was lower than that in Lu et al.'s (2010) study, in which the mean score for GDS-SF was 4.0. The participants in Lu et al. included a total of 189 frail and non-frail adults, of whom only 36 were frail older adults. When participants had higher scores for level of depressive symptoms, the mean score went up accordingly. In this study, 12 (12.77%) participants suffered from malnutrition, 31 (32.98%) were at risk of malnutrition, and 51 (54.26%) were classified as having a normal nutritional status. The percentage of this study is lower than that of Li, Kuo, and Lin (2013), in which the prevalence of risk of malnutrition was 64.7% of participants, and 5.9% suffered from malnutrition. This is because participants in this study were the elderly in an outpatient department, and, and most were capable of taking care of themselves. The institutionalized elderly have a higher prevalence of multiple comorbidities, and, in their activities of daily living, they are mainly dependent. In addition, long-term bedridden patients who need tube feeding and help with daily living often lose their appetite and suffer from malnutrition.

4.2. Factors that correlate with nutritional status

There is a significant correlation for age and comorbidity with nutritional status in this study, which is consistent with the results of Lin et al. (2017). Further, Lee and Liao's (2004) study noted that multiple comorbidities could cause physical changes; slow down digestion, absorption, and metabolism; and result in malnutrition. We also found a significant correlation between level of depressive symptoms and nutritional status, which is similar to the results of Kaburagi et al. (2011) and Saka, Kaya, Bahat, Erten, and Karan (2009). The results of Morley

Table 4
Correlation between GDS-SF questionnaires and risk of malnutrition (N = 94)

Variable	Risk of malnutrition		p
	No, n (%) MNA-SF (12–14)	Yes, n (%) MNA-SF (0–11)	
1.Are you basically satisfied with your life?			0.004**
Yes	33 (64.71)	12 (27.9)	
No	18 (35.29)	31 (72.1)	
2. Have you dropped many of your activities and interests?			0.360
Yes	12 (23.53)	14 (32.55)	
No	39 (76.47)	29 (67.44)	
3. Do you feel that your life is empty?			0.560
Yes	6 (11.76)	7 (16.28)	
No	45 (88.24)	36 (83.72)	
4. Do you often get bored?			0.350
Yes	11 (21.57)	13 (30.23)	
No	40 (78.43)	30 (69.77)	
5. Are you in good spirits most of the time?			0.150
Yes	5 (9.8)	9 (20.93)	
No	4 (90.2)	34 (79.07)	
6. Are you afraid that something bad is going to happen to you?			0.190
Yes	7 (13.72)	11 (25.58)	
No	44 (86.27)	32 (74.42)	
7. Do you feel happy most of the time?			0.060
Yes	3 (5.88)	9 (21.95%)	
No	48 (94.1)	34 (79.06)	
8. Do you often feel helpless?			0.170
Yes	1 (1.96)	4 (9.3)	
No	50 (98.04)	39 (90.7)	
9. Do you prefer to stay at home, rather than going out and doing new things?			0.740
Yes	5 (9.8)	6 (13.95)	
No	46 (90.2)	37 (86.05)	
10. Do you feel you have more problems with memory than most people?			0.240
Yes	2 (3.92)	5 (11.63)	
No	49(96.08)	38 (88.37)	
11. Do you think it is wonderful to be alive?			0.010**
Yes	42 (82.35)	18 (28.75)	
No	9 (17.65)	25 (58.14)	
12. Do you feel pretty worthless the way you are now?			0.460
Yes	3 (5.88)	5 (11.63)	
No	48 (94.12)	38 (88.37)	
13. Do you feel full of energy?			1.000
Yes	3 (5.88)	2 (4.65)	
No	48 (94.12)	41 (95.35)	
14. Do you feel that your situation is hopeless?			0.100
Yes	3 (5.88)	8 (18.6)	
No	48 (94.12)	35 (81.4)	
15. Do you think that most people are better off than you are?			0.15
Yes	5 (9.8)	9 (20.93)	
No	46 (90.2)	34 (79.07)	

*p < 0.05. ** p < 0.01. *** p < 0.001.

and Kraenzle's (1994) study show that depression is the most common cause of weight loss among the institutionalized elderly, indicating that mental illness has a strong influence on nutritional status.

4.3. Factors associated with risk of malnutrition

There was a significant negative correlation between the score on nutritional status and age. This result is similar to that reported by Lin et al. (2017), who found that older age was associated with higher risk of malnutrition. As such, frail older adults should be seen as at higher risk of malnutrition and should be monitored at all times. In addition, a significant negative correlation was found between level of depressive symptoms and nutritional status, similar to the results of Pérez,

Lizárraga, and Martínez (2014). This supports the hypothesis that malnutrition is related to depression. Further, we found, using the GDS-SF questionnaire, that participants who indicated that they were dissatisfied with their lives or to whom it felt terrible to be alive were at greater risk of malnutrition. Possible causes for elderly patients with depression to develop malnutrition include apathy, pessimism, and loss of pleasure in eating (Bailly et al., 2015; Li et al., 2013). Therefore, when taking care of frail older adults, caregivers need to pay attention to their depressive states and to provide proper treatment to address the problems associated with malnutrition.

5. Limitations

This study has certain limitations. First, we found an association between frail older adults and malnutrition, but we did not determine whether individual items of frailty, such as gait speed and handgrip strength, are associated with malnutrition status. Future research could test these associations. Second, this study used convenience sampling, and the small sample size may cause potential selection bias. Third, the study focused on depressive symptoms and nutritional status among frail older adults without performing a longitudinal follow-up to obtain data regarding long-term nutritional status of those with depressive symptoms. Finally, participants were recruited in an outpatient department, and, thus, their results for depressive symptoms as related to nutritional status might not be generalizable to frail older adults in other settings.

6. Conclusions

This study aimed to determine the relationship among depressive symptoms and nutritional status in frail older adults at an outpatient department. Although the prevalence of frailty was lower than that for frail older adults in nursing homes and hospitals, we were able to find a sufficient number of participants. Age, comorbidities, and level of depressive symptoms were significantly correlated with nutritional status among frail older adults. This suggests that frail older adults should be screened routinely for depressive status and provided with medication and therapies accordingly. When healthcare providers are faced with a high-risk group, such as the elderly with multiple comorbidities and depressive symptoms, they should perform an immediate assessment of nutritional status. If a risk of malnutrition is found, adequate nutrition and medical care should be provided.

Conflict of interest

The authors declare that there were no conflicts of interest.

Author contributions

C- TC and H- HT were responsible for this study's design. The participants were obtained by C- JW from the neurology Outpatient Clinic. H- HT supervised the study. H- HT,Y-CC was responsible for the drafting and revising of the manuscript. C-TC, H-HT, C- JW, H-FL, and W-H L approved the final manuscript.

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