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ORIGINAL STUDY

The Relationship Between Coronavirus-Related Anxiety on Physical Frailty, Psychological Frailty, and Social Frailty in Older Community-Dwellers in Taiwan During the COVID-19 Pandemic

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Abstract

Background: **Most activities in community centers have declined as a countermeasure against the COVID-19 pandemic. Consequently, multidimensional frailty rates gradually worsened. This research aimed to explore coronavirus-related anxiety and others factors that influence physical, psychological, and social frailty in older community-dwellers in Taiwan during the COVID-19 pandemic.**

Methods: **Two hundred and eight (208) elderlies over 65 years of age who lived in 12 administrative districts of Taipei City during the COVID-19 pandemic completed online questionnaires. The questionnaire asked for basic information, and included the coronavirus Pandemic Anxiety Scale, SARC-CalF of physical frailty, the Tilburg Frailty Indicator of psychological frailty, and the Questionnaire to define Social Frailty Status. Data were collected from 21 Ma y to 4 June 2022. They were analyzed using descriptive statistics, correlation coefficients, and one-way analysis of variance (ANOVA).**

Results: **The average scores for coronavirus anxiety was 2.61, physical frailty was 1.28, psychological frailty was 1.67, and social frailty was 2.25. Regression analysis indicated that the degree of anxiety-related symptoms was associated with physical and psychological frailty in older community-dwellers ($p < 0.01$, $p = 0.002$).**

Conclusions: **The anxiety related to coronaviruses in older community-dwellers affected their physical, psychological, and social frailty in Taiwan. We considered anxiety-related symptoms when assessing the frailty status of elderly to better understand their physical and mental health. Thus, these data support policy recommendations to reduce the effects of the elderly's anxiety-related symptoms on their frailty in future pandemics.**

Keywords: Coronavirus anxiety, Physical frailty, Psychological frailty, Social frailty, COVID-19 pandemic

1. Introduction

Taking advantage of their experience from the previous SARS outbreak in 2004, the Taiwan government immediately responded at the beginning of the Coronavirus Disease 2019 (COVID-19) pandemic. The government began strict health inspection of arrivals from Wuhan on January 1, 2020 [1]. Since then, the Taiwanese government has implemented strict border controls, intensified requests to wear masks in most public places, and conducted many mandatory case-based infection interventions [1]. In May 2022, COVID-19 infections in Taiwan peaked, breaking the two million mark for total cases, while the total number of cases per day continued to increase [2].

With the increasing threat of another outbreak, Taiwanese faced emotional distress and other psychological symptoms, supported by increased reports of stress disorders, anxiety, and depressive feelings [1,3]. Other studies have reported that people who suffered from the loss of immediate family

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members were at increased risk of infection and other long-term effects due to social isolation [4]. Anxiety was revealed to be the most common mental health symptom [4]. Individuals with higher levels of anxiety are more likely to have social disorders and exhibit disruptive behaviors, such as compulsive handwashing, exaggerated physical distancing, and fear of being vaccinated [5]. Although most people have taken precautions and practiced social distancing, elderly people continue to excessively fear their mortality and worry about the prospect of hospitalization [5]. The crisis caused by the global COVID-19 pandemic has gradually reduced the community care system that used local policies of the aging society as a strategy. When daily life was restricted to the home, the occurrence of disability or frailty in elderly populations accelerated, resulting in increased family burden, and increased long-term care expenses. As part of the aging process, it is inevitable that the physiological functions of multiple body systems deteriorate and that there is a higher frequency of comorbidities [6]. However, chronological age is not an accurate evidence-based indicator of early functional decline [6]. Although some people may maintain good health and resilience later in life, others may become progressively vulnerable to internal sources of stress [7].

Older frail adults are at increased risk of developing conditions with substantial adverse outcomes, such as hospitalization and increased mortality [6]. In fact, frailty was defined as the impairment of a one or more aspects of daily activities or self-rated, poor health. It is estimated that the prevalence of nonfrailty, prefrailty, and frailty among the elderly in Taiwan in 2003 were 55.1%, 40.0%, and 4.9%, respectively [8]. The traditional concept of frailty describes frailty as an accumulation of multidimensional deficits [8]. On the other hand, recently described conceptual models of frailty consider frailty to be a dynamic pre-disability state that contains loss in physical, psychological, or social domains [7]. These characteristics placed older frail adults at increased risk for morbidity and mortality, acute hospitalizations, and long-term utilization of healthcare services [9].

Older adults are a high-risk group for COVID-19. Many elderlies may rapidly develop states of critical chronic inflammation and immunodeficiency, and can become even more frail than before [10]. Increasing studies have suggested that the incidence rate of COVID-19 in older patients with frailty is higher than in elderly, non-frail people [10]. Early evaluation, detection, and effective intervention for frailty in older communities during the COVID-19 pandemic was conducive to significantly improving their quality of life and prognosis [11].

Taiwan will become a super-aged society by 2025; thus, the country needs to be well prepared and equipped with a community-based integrated care system to support older adults. Local health systems play an important role in preventing frailty in the elderly [12]. However, activities in community care centers have been reduced as a countermeasure against COVID-19, especially during the second wave in Taiwan. Unsurprisingly, frailty rates escalated and gradually worsened as a secondary problem correlated with COVID-19 countermeasures [11]. This research aimed to explore coronavirus-related anxiety and examined factors that influence physical, psychological, and social frailty in older community-dwellers in Taiwan during the COVID-19 pandemic. Although current longitudinal studies of the elderly community have confirmed that physical and social frailty negatively impact health status [11], the relationship between these two concepts remains unclear in the context of the current pandemic. Furthermore, based on previous studies, there is still a lack of a proper understanding of the relationships between anxiety and the multiple dimensions of frailty, which could directly affect the quality of life of older adults during the COVID-19 pandemic [12]. Furthermore, the previous literature did not identify whether physical, psychological, and/or social frailties were correlated with coronavirus-related anxiety from the perspective of Taiwanese communities. Therefore, exploring coronavirus-related anxiety and its effects on the multiple dimensions of frailty will provide information on the potential systematic management of COVID-19 prevention and control in future challenges.

Lockdown policies were implemented as a countermeasure to COVID-19. These policies resulted in decreased physical activity, increased psychological anxiety, and decreased social interactions, which may have led to higher frailty rates. It is important to determine whether coronavirus-related anxiety affects the development and severity of frailty, so that policy makers can consider optimal prevention strategies for future pandemics.

2. Methods

This study used a correlational research design to analyze the relationships between coronavirus-related anxiety and factors that influence physical, psychological, and social frailty in older community dwellers in Taiwan during the COVID-19 pandemic.

2.1. Participants

According to the Department of Civil Affairs of Taipei City, there were 504,106 elderly people in Taipei at the time of this study. Therefore, for this study, we assumed there was a finite population (N = 504,106), the confidence level was 90%, and the upper limit of error was established at 5.0%. According to the Taro Yamane formula, the estimated sample size would be 273 people. The inclusion criteria for the research subjects were: (1) over 65 years of age, (2) living in the community sector, (3) able to take care of themselves daily, and (4) able to communicate in Mandarin Chinese or Taiwanese. The exclusion criteria were: (1) receiving institutional care, (2) inability to understand the meaning of the questions on the questionnaire, or (3) those who were severely disabled and could not cooperate with the frailty assessment. Therefore, after analyzing the inclusion and exclusion criteria, the study sample group included 208 community-dwellers over 65 years of age who lived in Taipei City during the COVID-19 pandemic. Staff were trained to collect information and complete questionnaires at cooperating locations and healthcare centers in Taipei City. Interview procedures and interviewer behavior were standardized in a 4-h training course. This research study cooperated with health service centers in twelve districts of Taipei City and various districts or community colleges in Taipei City, participating in community-integrated cancer screening, influenza vaccination, and promotion of health education and other community activities. During this period, the study recruited as many participants as possible. We also provided feedback gifts to those who completed the questionnaire and physical assessment. Frailty is usually evaluated with instruments; however, due to the peak of the COVID-19 pandemic in the middle of May 2022, the research team performed the data collection through online questionaries. We also held online meetings with participants to provide instructions on how to perform physical self-assessments in order to obtain more accurate and representative results. The confidentiality of participant health information was considered throughout the data collection process. Participants may also have experienced anxiety or difficulty due to lack of face-to-face interaction with the researchers. Participants with low health literacy may have also had difficulty answering questions due to misunderstanding questions in surveys [13].

2.2. Instruments

The questionnaire was divided into four parts: The first part of the questionnaire contained nine sociodemographic related questions regarding sex, age, marital status, living status (living alone or with others), educational level, current work status, and harmful habits (smoking, drinking, consumption of betel nut consumption); the second part included 13 questions assessing anxiety due to COVID-19, based on the Coronavirus Pandemic Anxiety Scale [14] from the questionnaire by Bernardo et al. [14], translated into Chinese and then further adjusted. The scoring method was based on a 5-point Likert scale, with answers of 'strongly disagree,' 'disagree,' average, 'agree' and 'strongly agree' scored from one point to five points, respectively. The higher the score, the higher the level of anxiety of participants during the pandemic. Part three integrated three questions on physical frailty from the Study of Osteoporotic Fracture [SOF index] [15], including weight loss questions such as 'Have you lost more than 5% of your body weight in the past year without deliberate weight loss?', perceived lack of energy questions such as 'Have you felt that you cannot get enough energy to do things [More than three days in a week]?', and low mobility questions such as 'Can you stand up from a chair five times without supporting it with your hands?'. These questions were scored on a scale of zero to 3, where a total score of zero points was judged 'no frailty', a score of one was a 'pre-frailty stage', and a score of two or more was a 'frailty period.' In conjunction with community-based frailty screening for the elderly, the SOF index was selected as a frailty screening tool in older people in Taiwan (Long Care 2.0 policy) [15]. Part four used the Tilburg Frailty Indicator (TFI) scale as a measure of psychological frailty (Cronbach's $\alpha = 0.71$) including questions such as: 'Do you have problems with your memory?', 'Have you felt down during the last month?', 'Have you felt nervous or anxious during the last month?' and 'Are you able to cope with problems well?'. If the participant answered 'yes' to any question, the question would be scored with one point, and if the answer was 'no', the question would be scored zero points. Those with a total score of zero were judged to not have psychological frailty, those with a score of one were in the early stages of psychological frailty, and those with more than two points were experiencing psychological frailty. Part five used five questions from the Questionnaire to define the Social Frailty Status (QSFS) as a measure of frailty [16], including questions such as 'Do you live alone?', 'Do you go out less than the previous year?', 'Do you go out?', 'Do you sometimes visit friends?', 'Do you think you are helpful to your friends or family?', and 'Do you talk to other people every day (including phone calls or video)?". All five questions were answered by the

subject's own situation. If the answer to questions one through two was 'yes' and the answer to questions three through five was 'no', the question would receive one point. The total score of the five questions on social frailty ranged from zero to five points, of which a total score of zero points was judged to represent no social frailty, a score of one represented prosocial frailty, and those with a score of two or more were experiencing social frailty.

The item objective congruence (IOC) index of the items was used as a basis for assessing the quality of the items, which had a value greater than 0.50. The integrated questionnaire was examined by a panel of nine experts. The questionnaire was revised to carry out the pilot study with a population of 30 people. The Cronbach's alpha measure of internal consistency reliability for this scale was 0.891, indicating that the scale was reliable [17]. The anxiety difficulty of COVID-19 was tested to measure effective results with a difficulty value of 0.20−0.90. Therefore, the questionnaire used in this study meets the requirements to ensure the validity of the assessment [18].

2.3. Statistical analysis

Frequency, percentage, mean, and standard deviation data were calculated with IBM SPSS version 25. A p-value of less than 0.05 was considered to be statistically significant. The correlation coefficient was used to analyze the strength of the relationships among the variables. The effects of related anxiety, anxiety-related symptoms, and anxiety-related behaviors on three different types of frailty (physical, psychological, and social) among older community dwellers in Taiwan was examined using multiple linear regression analysis with the statistical significance set at $p < 0.05$. Univariate assumptions on the dependent variable were analyzed for normality and homogeneity of variance.

2.4. Ethical issues

This research was approved by the Review Boards of the Research Ethics Committee of the National Taiwan Normal University (202203HM016).

3. Results

The present study used descriptive statistical analysis, reliability analysis, Pearson's correlation analysis, and regression analysis. Analysis of the personal characteristics of study participants showed that the majority of participants were women (n = 125, 60.1%), the mean age was 70.33 years (SD = 5.357), 156 (75.0%) were married, 184 lived with their family members (88.5%) and 24 lived alone (11.5%). 98 participants had a bachelor's degree, representing 47.1% of the total participants. 171 were retired and 18 had full-time jobs, which were 82.2% and 8.7% of the total participants, respectively. Most were nonsmokers (78.8%), nondrinkers (70.7%), and did not eat betel nuts (99.0%), Table 1.

Through the factor analysis method, we determined the suitability of coronavirus-related anxiety for principal component analysis (PCA). The results from the Kaiser-Meyer-Olkin (KMO) and Bartlett's sphericity tests were 0.871 ($p < 0.001$); these results indicated that the data was suitable for PCA. The loaded factor analysis found that 6 items showed a

Table 1. Distribution of sociodemographic characteristics among study participants.

Variables	Frequency	%
Gender		
Female	125	60.1
Male	83	39.9
Age (years)		
65−74	177	85.1
75−84	26	12.5
85−94	4	1.9
95−104	0	0
105+	1	0.5
Housing Status		
Lives alone	24	11.5
Lives with others	184	88.5
Marital status		
Unmarried	9	4.3
Widowed	29	13.9
Divorced	14	6.7
Married	156	75.0
Education Level		
None	1	0.5
Primary education	20	9.6
Junior High School	14	6.7
Senior High School	42	20.2
Vocational High School	32	15.4
University Education	98	47.1
Current working status		
Full-time	18	8.7
Part-time	19	9.1
Retired	171	82.2
Harmful Habits [Smoking]		
Never smoked	164	78.8
Currently, not smoking	36	17.3
Smokes sometimes	5	2.4
Smokes every day	3	1.4
Harmful Habits [Drinking Alcohol]		
Does not drink.	147	70.7
Sometimes drinks.	59	28.4
Drinks every day	2	1.0
Harmful Habits [Eating Betel Nuts]		
Sometimes eats	1	0.5
Does not eat	207	99.5

Table 2. Descriptive statistics (mean and standard deviation, SD) for anxiety and frailty variables studied (n = 208).

Variables	High (%)	Low (%)	Mean	SD
Coronavirus anxiety	129 (62%)	79 (38%).	2.62	0.86
Anxiety-related behaviors	162 (77.9%)	46 (22.1%)	3.06	1.10
Anxiety-related symptoms	81 (38.9%)	127 (61.1%)	2.08	0.94
Physical frailty	7 (3.4%)	201 (96.6%)	1.28	0.37
Psychological frailty	23 (11.1%)	185 (88.9%)	1.67	0.40
Social frailty	95 (45.7%)	113 (54.4%)	2.25	0.29

higher correlation with the subcategory of anxiety-related behaviors, while 7 items were classified as anxiety-related symptoms. Table 2 shows the mean measured values for coronavirus-related anxiety, anxiety-related behaviors, anxiety-related symptoms, physical frailty, psychological frailty, and social frailty. The average scores for coronavirus-related anxiety were 2.61 (SD = 0.86), anxiety-related behavior was 3.06 (SD = 1.10) and anxiety-related symptoms was 2.08 (SD = 0.94). The average scores for physical frailty, psychological frailty, and social frailty scores were 1.28 (SD = 0.37), 1.67 (SD = 0.40), and 2.25 (SD = 0.29), respectively. 77.9% of the respondents had a low level of anxiety-related behavior; while 61.1% of them have a low level of anxiety-related symptoms. A high percentage of respondents (96.6%) had a low level of physical frailty.

Table 3 shows the correlation between coronavirus-related anxiety and physical frailty, psychological frailty, and social frailty in older community dwellers in Taiwan due to the COVID-19 pandemic ($r = 0.456$, $r = 0.504$, $r = 0.200$, $p < 0.001$).

In the multiple linear regression analysis, this study explores the influence of coronavirus anxiety, anxiety-related behavior, and anxiety-related symptoms (as independent variables) on physical frailty, psychological frailty, and social frailty (as dependent variables, each in separate models). The combined effect of coronavirus anxiety, anxiety-related behavior, and anxiety-related symptoms together on physical frailty was statistically significant ($F(3, 204)) = 24.65$, $p < 0.001$, $R^2 = 29.009$). The data summarized in Table 4 show that there is a statistically significant correlation between anxiety-related symptoms and physical frailty ($\beta = 0.461$, $p = 0.002$).

The combined effect of coronavirus anxiety, anxiety-related behavior, and anxiety-related symptoms together on psychological frailty was statistically significant ($F(3, 204)) = 29.69$, $p < 0.001$, $R^2 = 33.007$). The results shown in Table 5 indicates that anxiety-related symptoms were statistically significantly associated with psychological frailty ($\beta = 0.510$, $p = 0.001$).

The combined effect of coronavirus anxiety, anxiety-related behavior, and anxiety-related symptoms together on social frailty was statistically significant ($F(3, 204)) = 3.419$, $p = 0.018$, $R^2 = 17.658$). No statistically significant effects on social frailty were observed for coronavirus anxiety, nor for anxiety-related behavior or anxiety-related symptoms, Table 6.

Table 3. Correlation coefficients between anxiety and frailty variables studied (n = 208).

Variable	Coronavirus anxiety	Anxiety-related behavior	Anxiety symptoms	Physical frailty	Psychological frailty	Social frailty
Coronavirus anxiety	1					
Anxiety-related behavior	0.850**	1				
Anxiety-related symptoms	0.861**	0.569**	1			
Physical frailty	0.456**	0.308**	0.515**	1		
Psychological frailty	0.504**	0.384**	0.544**	0.559**	1	
Social frailty	0.200**	0.216**	0.151*	0.172*	0.172*	1

Note[s]: *$p < 0.05$, **$p < 0.01$.

Table 4. Multiple linear regression analysis of the influence of coronavirus-related anxiety, anxiety-related symptoms, and anxiety-related behavior on physical frailty.

	Unstandardized Coefficients		Standardized Coefficients	t-value	p-value
Variable	B	Std. Error–	Beta		
[Constant]	0.836	0.074		11.319	<0.001
Coronavirus anxiety	0.033	0.101	0.075	0.325	0.745
Anxiety-related behavior	−0.006	0.049	−0.018	−0.128	0.898
Anxiety-related symptoms	0.183	0.059	0.461	3.098	0.002

Notes: Dependent variable: physical frailty; Independent variables: Coronavirus anxiety, anxiety-related behavior, and anxiety-related symptoms.

Table 5. Multiple linear regression results for influence of coronavirus-related anxiety, anxiety-related behavior, and anxiety-related symptoms on psychological frailty.

ANOVA[a] model	Sum of squares	df	Mean square	F	Sig.
Regression	10.033	3	3.344	29.697	<0.001[b]
Residual	22.974	204	0.113		
Total	33.007	207			
Coefficients[a]					
	Unstandardized Coefficients		Standardized Coefficients Beta	t	Sig.
Mode	B	Std. Error−			
[Constant]	1.127	0.077		14.697	<0.001
Coronavirus anxiety	−0.024	0.105	−0.051	−0.228	0.820
Anxiety-related behavior	0.050	0.051	0.138	0.985	0.326
Anxiety-related symptoms	0.215	0.061	0.510	3.519	0.001

Notes: **ANOVA[a]**: Dependent variable: psychological frailty; [b] Independent variables: Coronavirus anxiety, anxiety-related behavior, and anxiety-related symptoms. Dependent variable: psychological frailty.

Table 6. Regression analysis of the influence of coronavirus-related anxiety, anxiety-related behavior, or anxiety-related symptoms on social frailty.

ANOVA[a] model	Sum of squares	df	Mean square	F	Sig.
Regression	0.845	3	0.282	3.419	0.018[b]
Residual	16.813	204	0.082		
Total	17.658	207			
Coefficients[a]					
	Unstandardized Coefficients		Standardized Coefficients Beta	t	Sig.
Mode	B	Std. Error.−			
[Constant]	2.063	0.066		31.435	<0.001
Coronavirus anxiety	0.003	0.089	0.008	0.032	0.974
Anxiety-related behavior	0.050	0.044	0.188	1.151	0.251
Anxiety-related symptoms	0.011	0.052	0.036	0.214	0.831

Notes: **ANOVA[a]**: Dependent variable: social frailty; [b] Coronavirus anxiety, anxiety-related behavior, and anxiety-related symptoms. Dependent variable: social frailty.

Finally, the multiple linear regression analysis found that three factors combined (coronavirus anxiety, anxiety-related behavior, and anxiety-related symptoms) had statistically significant associations with physical frailty, psychological frailty, and social frailty (each separately). However, when examining the impact of each factor pertaining to anxiety individually, only the subcategory of anxiety-related symptoms had statistically significant associations with physical and psychological frailty (each separately).

4. Discussion

To date, the Taiwanese government has maintained some of the strictest pandemic-related border controls in the world, despite most countries announcing the reopening or relaxation of border restrictions. With the increase in the number of infections, the prevalence of major depressive disorders and anxiety disorders also increased [3]. Therefore, it is still important to understand the influence of coronavirus-related anxiety on the frailty status of older adults in the context of epidemic countermeasures. Our results showed that coronavirus-related anxiety in older adults affected two dimensions of frailty, especially their anxiety-related symptoms, such as often having a sore throat, feeling fast heart beating, restless and irritable, and finding it difficult to relax, fall asleep, breathing. These data indicated that these anxiety-related symptoms in older adults could affect their physical and psychological frailties, which can further induce and promote multiple symptoms and comorbidities [5,19].

Coronavirus-related anxiety was considered in this study when assessing the frailty status of elderly participants to better understand their physical and mental health and contribute to knowledge and interventions in this population to reduce their risk of frail [19]. If an elderly person is concerned that they or their family member may become infected or reveal anxiety-related symptoms, they may panic thinking about the behavior of people suspected of

being infected, which can lead to negative consequences for their physical health. These findings are also in line with a previous study that pointed out that moderate to high psychological distress was associated with the health of family members and close relatives [19]. However, our findings show that coronavirus-related anxiety did not affect social frailty, specifically indicating that the degree of coronavirus-related anxiety did not decrease social interactions and activities in the original community [4]. In fact, some studies have stated that psychological frailty during COVID-19 appears to be attenuated by older age. This finding may be inconsistent with previous studies, in which social disconnection and isolation lead older adults to an increased risk of depression and anxiety [20]. Perhaps older people who are healthier have developed the ability to adapt, and show greater resilience during a prolonged pandemic period [21].

The present study has several potential limitations. First, the method of collecting data via the Internet was not the most optimal way to access older populations; as a result, we acquired data from self-reports instead of through direct quantitative measurements. For example, muscle strength, a component of physical frailty, was not measured using instruments. The sample size of this study was small; therefore, ongoing research will be conducted with face-to-face surveys and quantitative measurements with large sample sizes. Second, this study was a pilot research study in twelve districts of Taipei City, which may have a homogeneous distribution of individuals. These findings may not be generalizable to other settings because they were based on a single province of Taipei city. Finally, this cross-sectional research cannot indicate causal inferences; future studies will be conducted as a prospective cohort study to determine the direction and cause of factors.

5. Conclusions

Our results highlight the importance of mental health in older people, especially during the COVID-19 pandemic. This research revealed that coronavirus-related anxiety was correlated with frailty dimensions. In addition, anxiety-related symptoms affected only physical frailty and psychological frailty, but not social frailty, in older community-dwellers in Taiwan. Therefore, our results could provide a guide for policy making to reduce the effects of physical and psychological fragility on symptoms related to anxiety in the elderly during future pandemics.

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Conflict of interest

None.

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