Age and Ageing 2021; **50:** 1011–1018
https://doi.org/10.1093/ageing/afab061
Published electronically 11 March 2021

RESEARCH PAPER

Changes in psychological distress before and during the COVID-19 pandemic among older adults: the contribution of frailty transitions and multimorbidity

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Abstract

Aim: To investigate changes in psychological distress in community-dwelling older adults before and during the coronavirus disease 2019 (COVID-19) pandemic and the contribution of frailty transitions and multimorbidity in predicting the psychological distress.
Methods: Prospective repeated-measures cohort study on a sample of participants aged 60 and over. A total of 2, 785 respondents at the baseline (May 2019) were followed during the COVID-19 (August 2020). The changes in psychological distress before and during the COVID-19 were assessed using generalised estimation equations with adjusting for sex, age, education, economic status, marital status, tea drinking status, smoking status, alcohol drinking status, sedentary time, sleep quality and activities of daily living.
Results: The psychological distress of older people has significantly increased in August 2020 compared with May 2019. Both older adults who remained frail and transitioned into frail state reported more psychological distress during the COVID-19. Similarly, both pre-existing multimorbidity and emerging multimorbidity groups were associated with more psychological distress. The group of frailty progression who reported new emerging multimorbidity showed more increase in psychological distress in comparison with those who remained in the non-frail state who reported no multimorbidity.
Conclusion: Psychological distress has increased among the community-dwelling older adults during the COVID-19 pandemic, and sustained and progressive frail states as well as multimorbidity were all associated with a greater increase of psychological distress. These findings suggest that future public health measures should take into account the increased psychological distress among older people during the COVID-19 pandemic, and the assessment of frailty and multimorbidity might help in warning of psychological distress.

Keywords: COVID-19, older people, psychological distress, frailty transition, multimorbidity

Key Points

- The psychological distress has significantly increased among community-dwelling older adults.
- Older adults who remain frail and transition into frail state have more psychological distress during the COVID-19.
- Pre-existing multimorbidity and emerging multimorbidity have more psychological distress during the COVID-19.

- Older people who report frailty progression with new emerging multimorbidity have more increased psychological distress.
- The assessment of frailty and multimorbidity might help in warning of psychological distress.

Introduction

The outbreak of coronavirus disease 2019 (COVID-19) has rapidly spread worldwide, and the World Health Organization (WHO) has declared the outbreak of COVID-19 a pandemic on 11 March 2020 [1]. Although China has controlled the pandemic quickly, there is still a risk of sporadic cases, imported cases and clusters of outbreaks for a long period [2]. Thus, the restrictions in China are remained, including some quarantine or isolation measures still in place, movement restrictions (needing health code), entry and exit registration, etc. Whether the COVID-19 outbreak is effectively controlled or not, the widespread contagion, restrictions on going outdoors, financial losses and fewer opportunities of interpersonal contact may lead to a negative impact on mental health for the general public [3,4]. It is reported that the risk of contracting and dying from COVID-19 is increased in older people aged 60+ [5,6], thus, the pandemic may cause worse mental health among older people due to the fear of being infected with COVID-19. However, cross-sectional studies [7–9] are unable to assess the magnitude of its impact due to lack of pre-COVID-19 data. We found no longitudinal community-based studies to investigate the same older individuals' changes in psychological distress before and during the COVID-19 pandemic in China.

During this pandemic, the clinical importance of frailty and its assessment has been gradually highlighted [10,11]. Frailty, a critical ageing-related clinical syndrome of reduced physiological reserve with diminished homeostasis [12] is a vital risk factor for predicting severe COVID-19 disease [13]. Previous studies have shown the association between frailty and mental health [14,15]; however, these have largely been based on comparisons between frail and non-frail individuals. What we want to emphasise is that frailty is a dynamic process with the potential for both frailty progression and recovery from a frail to a non-frail state over time [16,17]. In other words, the effects of frailty on health are not static. Understanding how the dynamic nature of frailty impacts mental health among older people during the COVID-19 is critical to inform targeted measures to maintain their mental health; however, it has received no attention in the literature.

Multimorbidity, known as the co-occurrence of two or more chronic conditions, has been suggested as another risk factor for mental health [18,19]. It is becoming increasingly common and likely to increase progressively with age [20]. Accumulation of chronic conditions in older adults is a milestone for the progressive loss of resilience and homeostasis [21], thus, having multimorbidity may be not only physically challenging but also worsen mental health for older people during the COVID-19. We found no study has considered the role of multimorbidity played in affecting the mental health of older people who have transitioned into frail state during the COVID-19. In addition, one study has shown that new emerging multimorbidity is associated with more functional decline than pre-existing multimorbidity [22], suggesting emerging multimorbidity and pre-existing multimorbidity may have different effects on health among older people.

Understanding the role of frailty transition and multimorbidity in changes of psychological distress during the COVID-19 pandemic has important implications for designing focused interventions to prevent and reduce psychological distress among older people. The present study aimed to assess the changes in psychological distress of older people before and during the COVID-19 and to evaluate the differential effects of frailty transitions and multimorbidity on the psychological distress during the COVID-19 pandemic.

Methods

Study design and sample

The present study used data from the Shandong Rural Elderly Health Cohort (SREHC). SREHC, which is an ongoing longitudinal study aiming at addressing ageing problems, targeted the population aged 60 and above in Shandong rural areas. Information collected in SREHC mainly includes a rich set of questions regarding demographics, socio-economic status, lifestyles, physical and psychological health of older people. The SREHC baseline survey was conducted from May 2019 to June 2019, which was considered as prior to the COVID-19 pandemic in this study based on the declaration from the WHO [1]. A multistage stratified random sampling method was used to select the participants at baseline. First, all of the counties in Shandong province were stratified into three groups on the basis of Gross Domestic Product (GDP) per capita in 2018. Second, we chose one county from each group randomly. Three counties (Rushan, presented as high-level county; Qufu, presented as medium-level county and Laoling, presented as low-level county) were then chosen as the study sites, and then, five townships were randomly selected from each sample rural county. Third, four communities/villages were selected from each township. Participants were randomly selected among older adults aged 60 years and above using community resident registry that included the residents' contacts in each community. In total, 3 rural counties, 15 towns, 60 communities and 3,600 interviewees were recruited, of which, 3,243 respondents without a clinical diagnosis of dementia and

psychiatric diseases completed the baseline survey. Of the 3,243 respondents at baseline, 2,785 participated in the follow-up survey during the COVID-19 pandemic from August 2020 to September 2020. To ensure quality, both of the two surveys were conducted via face-to-face by trained master students. Training was supervised by our principal investigator. Considering the potential poor vision of older adults, the questionnaires were read to the respondents by our interviewers. Completed questionnaires were carefully checked by quality supervisors at the end of each day.

Measures

Psychological distress

Psychological distress was assessed by Kessler Psychological Distress Scale (K10), which was a commonly used tool for screening mental health [23,24], and the reliability and validity of the K10 have been confirmed in China [25]. The scale evaluated the psychological distress of the respondents, including depression, anxiety, nervousness, hopelessness, restlessness and worthlessness in the past 4 weeks. The scale contained 10 items and each item is scored from 1 (none of the time) to 5 (all of the time). The total score for the scale ranged from 10 to 50 points, and the higher scores indicated the higher risk of psychological distress.

Frailty

Frailty status was measured by frailty phenotype criteria, which was proposed and validated by Fried et al. [12]. It consists of five items: shrinking (unintentional weight loss), weakness (grip strength), slowness (a walking time of 4.6 m adjusted by gender and height), self-reported exhaustion and self-reported low activity. Older people with three to five criteria were considered to be frail, zero to two criteria were considered to be non-frail. In our study, frailty transition was defined as frailty status from a given state at baseline to another state at follow-up, including from a given state to that the same state [26]. Thus, we classified the respondents into four frailty transition groups: (i) stable non-frail (who remained in the non-frail state during the survey period), (ii) frailty progression (who transitioned from the non-frail before the COVID-19 pandemic to the frail state during the COVID-19 pandemic); (iii) frailty recovery (who transitioned from the frail before the COVID-19 pandemic to the non-frail state during the COVID-19 pandemic) and (iv) stable frail.

Multimorbidity

In this study, we defined multimorbidity as the co-existing of two or more chronic non-communicable diseases based on previous studies [27,28] and the Chinese Centers for Disease Control and Prevention (CDC) recommendations [29], including hypertension, diabetes, dyslipidemia, heart disease, asthma, stroke, cancer, chronic lung disease, digestive disease, liver disease, kidney disease and arthritis. All chronic conditions were self-reported. To validate the accuracy of this information, the trained interviewers with medical knowledge would further ask the help from the village doctors to confirm the self-reported chronic condition information in the chronic disease case management system in the sampling villages. Then we categorised the progression of multimorbidity into three groups: no multimorbidity (no or on chronic condition reported), pre-existing multimorbidity ($\geq$2 diseases reported at the baseline) and emerging multimorbidity (no or one disease reported at the baseline, but $\geq$2 diseases reported at the follow-up survey).

Co-variates

We identified the potential confounders on the basis of the existing studies [8,15,30], including sex, age, education (illiteracy, primary school, junior school or above), marital status (married vs. divorced/widowed), economic status (household income per capita; Quartile 1 was the poorest and Quartile 4 was the richest), smoking status (current vs. never/past), alcohol drinking status (current vs. never/-past), tea drinking habits (whether the respondent was a daily tea drinker), sedentary behaviour (hours/day), physical disability and sleep quality. Physical disability was assessed by the activities of daily living (ADL) [18], including bathing, dressing, using the toilet, continence, transferring and eating. We used the Pittsburgh Sleep Quality Index (PSQI) [31] to measure the sleep quality of the participants, and a total score of PSQI greater than 7 was classified as poor sleep quality [32].

Analysis

First, all study variables were performed with a descriptive analysis. Second, we used the generalised estimating equation (GEE) model with unstructured working correlation matrix to account for the clustered nature of the participant for estimating the changes of psychological distress within individuals before and after the COVID-19. The subgroups, including the types of frailty transition state and multiple chronic conditions, were analysed using the same methods. The mean estimated changes were calculated with 95% confidence intervals (95% CI). Third, we carried out a sensitivity analysis to examine the effects of frailty transition and multimorbidity progression on psychological distress during the COVID-19 using ordinary least squares regression, adjusting for sex, age, education, economic status, marital status, tea drinking status, smoking status, alcohol drinking status, sedentary time, sleep quality, ADL and the baseline K10 score. We used STATA 14.2 (StataCorp, College Station, TX, USA) for all analysis.

Results

As the flow chart have shown in Figure 1, a total of 2,785 older people who participated in both the baseline and follow-up surveys were included in our study, with a response rate of 85.88% (2,785/3,243). Table 1 shows the

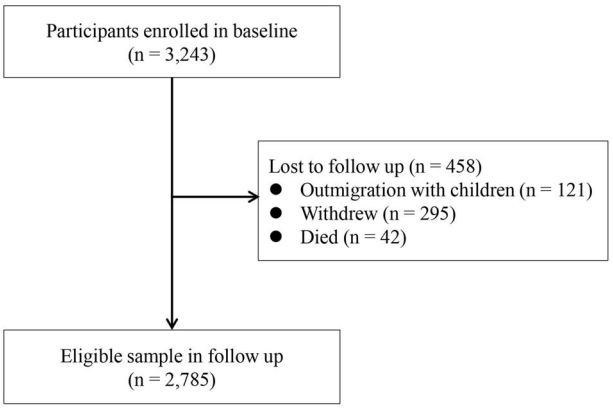

Figure 1. Flowchart of participant selection in this study

participant characteristics at each wave of data collection. Of the 2,785 respondents, the median age was 70 years, with a range from 60 to 100, 1,770 were female (63.55%) and 1,164 were illiterates (41.80%). There were 40 older people with missing data not imputed. Older people completing the questionnaire ($n = 2,745$) were more likely to be wealthier ($\chi^2 = 10.25$, $P = 0.017$) and non-frail ($\chi^2 = 6.58$, $P = 0.010$) than those who died ($n = 42$). Completers were also older than non-completers but younger than those who died ($F = 3.78$, $P = 0.023$). Of all frailty transitions, 11.91% constituted progression to a frail state, and 10.49% comprised recovery from a frail to a non-frail state. Regarding the multimorbidity progression, 36.18% had pre-existing multimorbidity before COVID-19, and 15.73% had new emerging multimorbidity during COVID-19 (Table 2).

Table 2 shows the psychological distress changes according to the frailty transitions and multimorbidity progression between before and during COVID-19 pandemic. Of the 2,785 included respondents, 2,745 (98.56%) exhibited complete data and were included in the GEE model. After adjustment for sex, age, education, economic status, marital status, tea drinking status, smoking status, alcohol drinking status, sedentary time (hours/day), sleep quality and ADL, the results showed that the psychological distress significantly deteriorated in August 2020 compared with May 2019. The K10 score values increased from 16.64 ± 7.44 to 18.23 ± 8.06 with an estimated change of 1.35 [95% CI: 1.12–1.58], $P < 0.001$. In the subgroups of frailty transition analyses, all the K10 scores were significantly increased in subgroup analyses (stable non-frail group: increased from 15.33 ± 6.51 to 16.52 ± 7.13 with an estimated change of 0.99 [95% CI: 0.74–1.24], $P < 0.001$; non-frail to frail group: increased from 16.71 ± 6.82 to 20.80 ± 7.95 with an estimated change of 3.10 [95% CI: 2.17–4.03], $P < 0.001$; stable frail group: increased from 22.22 ± 8.86 to 25.31 ± 8.34 with an estimated change of 2.75 [95% CI: 1.80–3.91], $P < 0.001$), except for the frailty recovery group (from 21.39 ± 8.93 to 21.80 ± 9.13, $P = 0.111$). In the subgroups of multimorbidity analyses, all the K10 scores were significantly increased during the COVID-19 (no multimorbidity group: increased from 15.16 ± 6.71 to 16.45 ± 7.40 with an estimated change of 0.63 [95% CI: 0.33–0.92], $P < 0.001$; pre-existing multimorbidity group: increased from 18.27 ± 7.63 to 19.97 ± 8.10 with an estimated change of 1.15 [95% CI: 0.76–1.54], $P < 0.001$; emerging multimorbidity group: increased from 17.41 ± 8.19 to 19.70 ± 8.70 with an estimated change of 1.31 [95% CI: 0.63–1.99], $P < 0.001$).

The sensitivity analysis shows a consistent finding with the main analyses, that both frailty transition and multimorbidity were associated with increased psychological distress during COVID-19, and the association was particularly pronounced for the group of frailty progression who reported new emerging multimorbidity (Supplementary Table S1, Supplementary data are available in *Age and Ageing* online).

Discussion

Maintaining good mental health in older adults is crucial for their physical health and well-being [33], especially during the pandemic of COVID-19 period [34]. The pandemic of COVID-19 as an uncontrollable stressful life event may have worsened mental health among older adults. In this repeated-measures longitudinal observational study, we found that psychological distress of older people increased from the prior to during the COVID-19 pandemic, which is similar to studies in Asia showing a substantial burden of psychological distress following the COVID-19 [34–36]. This study contributes new evidence to the existing literature from the perspective of older people and underscores the importance of developing mental health management and intervention among community-dwelling older people during major public health events.

We found no studies have addressed the associations between frailty transitions, progressive multimorbidity and psychological distress among older people, especially in the context of COVID-19 pandemic. However, previous studies pointed out the correlations between frailty and mental health [14,15], as well as multimorbidity and mental health [18,19], separately. No studies have considered these impacts simultaneously. In this study, we showed that both of the sustained and progressive frail state experienced a greater increase of psychological distress during the COVID-19 pandemic than remained non-frail individuals, emphasising the importance of preventing and ameliorating frailty in reducing psychological distress when facing major public health issues. Biologically, this link seems reasonable because frailty is related to a higher risk of poor resolution of homeostasis after stressor events [37]. For example, Vilches-Moraga et al. found that frailty was strongly associated with the increased level of need care at discharge [38]. Another explanation for this finding is that older adults may feel less control over the future as a result of decreased physical function when transitioning into frail state [15], plus the fear and worry that resulted from the pandemic, leading to more

Table 1. Sample characteristics before and during the COVID-19 pandemic

	Before COVID-19 ($n = 3,243$)	During COVID-19 ($n = 2,785$)
Sex		
Male	1,180 (36.39)	1,015 (36.45)
Female	2,063 (63.61)	1,770 (63.55)
Age		
60–65	825 (25.44)	549 (19.71)
65–70	989 (30.50)	805 (28.90)
70–75	822 (25.35)	791 (28.40)
>75	607 (18.72)	640 (22.98)
Education		
Illiteracy	1,353 (41.72)	1,164 (41.80)
Primary school	1,258 (38.79)	1,076 (38.64)
Junior school or above	632 (19.49)	545 (19.57)
Marital status		
Divorced/widowed	828 (25.53)	723 (25.96)
Married	2,415 (74.47)	2,062 (74.04)
Economic status		
Q1	802 (24.73)	686 (24.63)
Q2	795 (24.51)	697 (25.03)
Q3	830 (25.59)	695 (24.96)
Q4	816 (25.16)	707 (25.39)
Tea drinking habits		
No	1,913 (58.99)	1,653 (59.38)
Yes	1,330 (41.01)	1,131 (40.63)
Missing	0	1
Smoking status		
Never/past	2,565 (79.09)	2,234 (80.27)
Current	678 (20.91)	549 (19.73)
Missing	0	2
Alcohol drinking status		
Never/past	2,528 (77.95)	2,182 (78.43)
Current	715 (22.02)	600 (21.57)
Missing	0	3
Sleep quality		
Good	1,488 (45.88)	995 (35.74)
Poor	1,755 (54.12)	1,789 (64.26)
Missing	0	1
ADL disability, mean (SD)	0.39 (1.39)	0.44 (1.60)
Sedentary time (hours/day), mean (SD)	4.35 (1.99)	4.42 (2.11)
Missing	4	4
Chronic conditions		
No chronic condition	897 (27.66)	692 (24.85)
One chronic condition	1,205 (37.16)	958 (34.40)
Multimorbidity	1,141 (35.18)	1,135 (40.75)
Frailty status		
Non-frail	2,660 (82.02)	2,233 (80.67)
Frail	583 (17.98)	535 (19.33)
Missing	0	17
K10, mean (SD)	16.60 (7.46)	18.23 (8.0)
Missing	0	36

SD, standard deviation.

psychological distress. Our finding also supports the frailty identity crisis, a hypothesis that characterises a psychological syndrome accompanying the transition from robust to frailty [39]. However, we found no association between the frail to non-frail state and increased psychological distress, which reinforces the importance of intervention on frailty. Our findings underscore the negative effects and distinct prognostic value of certain frailty transitions. In other words, the dynamic nature of frailty transitions that we observed and the association of these dynamic changes with increased psychological distress during the COVID-19 pandemic suggest that promoting frailty recovery is critical to prevent or reduce psychological distress.

This study also suggests that multimorbidity is associated with the increased psychological distress during the COVID-19, which is particularly more pronounced for older

Table 2. Psychological distress changes among older people by frailty transition and multimorbidity before and during the COVID-19 pandemic

	n (%)	Before COVID-19 mean (SD)	During COVID-19 mean (SD)	Estimated change [95% CI]	*P* value
Overall	2,745	16.64 (7.44)	18.23 (8.06)	1.35 [1.12, 1.58]	<0.001
Frailty transition state					
Stable non-frail	1,926 (70.16)	15.33 (6.51)	16.52 (7.13)	0.99 [0.74, 1.24]	<0.001
Frail to non-frail	288 (10.49)	21.39 (8.93)	21.80 (9.13)	0.58 [−0.13, 1.29]	0.111
Non-frail to frail	327 (11.91)	16.71 (6.82)	20.80 (7.95)	3.10 [2.17, 4.03]	<0.001
Stable frail	204 (7.43)	22.22 (8.86)	25.31 (8.34)	2.75 [1.80, 3.91]	<0.001
Multiple chronic conditions					
No multimorbidity	1,319 (48.05)	15.16 (6.71)	16.45 (7.40)	0.63 [0.33, 0.92]	<0.001
Pre-existing multimorbidity	994 (36.21)	18.27 (7.63)	19.97 (8.10)	1.15 [0.76, 1.54]	<0.001
Emerging multimorbidity	432 (15.74)	17.41 (8.19)	19.70 (8.70)	1.31 [0.63, 1.99]	<0.001

Forty individuals were excluded due to having missing data. Estimated change and 95% CI were calculated with GEEs. All models were adjusted for sex, age, education, economic status, marital status, tea drinking status, smoking status, alcohol drinking status, sedentary time, sleep quality and ADL.

people who have reported new emerging multimorbidity than pre-existing multimorbidity. We sought to further determine whether frailty progression will interact with emerging multimorbidity to predict increased psychological distress during the COVID-19 pandemic. Our results suggest that psychological distress has increased for older people who reported new emerging multimorbidity coinciding with the transitioning into frail state, while the association between the frailty progression and the increased psychological distress was not present for older people with multimorbidity reported before the frailty progression. Older people with long-existing multimorbidity before frailty progression may have accumulated experience and a better understanding of own health conditions and may have increased their mental resilience to health-related stress [40]. These accumulated advantages may have protected them from more negative health outcomes resulting from the transitioning into frail state, and they may have a better regulation of their emotional responses to stressful events compared with those who reported no multimorbidity [22] before and during the COVID-19 pandemic. Our findings have significant implications for the assessment of frailty state and management of chronic conditions in clinical application to prevent or reduce psychological distress during the COVID-19 pandemic. Identifying factors that contribute to the frailty transitions and progressive multimorbidity are beyond the scope of the current study, but it would require much attention in the future research.

These findings highlight the importance of screening frailty and multimorbidity among community-dwelling older people and imply that preventing and ameliorating frailty as well as the management of multimorbidity may be an effective strategy to reduce psychological distress among older people when facing major public health issues. However, how the effect of frailty and multimorbidity intervention on psychological health and which intervention should be practically incorporated into a clinical practice should be the future research direction.

This study also has several limitations. First, we assessed the chronic conditions using self-reported, which may result in some recall bias. Second, our longitudinal sample only included older people who completed the two waves, and there might be possible selection bias associated with the attrition over the study. Third, this study was conducted only in rural older people and whether the results are applicable to urban older people needs further study.

Conclusion

In this prospective study, we found that the psychological distress has increased among the community-dwelling older adults during the COVID-19 pandemic. Sustained and progressive frail states as well as multimorbidity were all associated with a greater increase of psychological distress during the COVID-19 pandemic, and the association between frailty progression and psychological distress was particularly pronounced for older people who reported new emerging multimorbidity. These findings suggest that future public health measures should take into account the increased psychological distress among older people, and the assessment of frailty and multimorbidity might help in warning of psychological distress.

Supplementary Data: Supplementary data mentioned in the text are available to subscribers in *Age and Ageing* online.

Declaration of Sources of Funding: This work was supported by the National Science Foundation of China (grant numbers 71774104, 71974117), the China Medical Board (grant number 16-257) and Cheeloo Youth Scholar Grant and Shandong University (grant numbers IFYT1810, 2012DX006). The study sponsor has no role in the study design, data analysis and interpretation of data, the writing of manuscript or the decision to submit the paper for publication.

Declaration of Conflicts of Interest: None.

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Received 16 January 2021; editorial decision 14 February 2021