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Regular Research Article

Psychological and Functional Impact of COVID-19 in Long-Term Care Facilities: The COVID-A Study

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ABSTRACT

Objective: To analyze the psychological and functional sequelae of the COVID-19 pandemic among older adults living in long term care facilities (LTCFs). *Design:* Cohort longitudinal study **Setting ant participants:** *A total of 215 residents ≥ 65 years without moderate-to-severe cognitive impairment, living in five LTCFs in Albacete (Spain). **Measurements:** Baseline on-site data were collected between March - June 2020 and three-month follow-up between June to September 2020. Symptoms of depression, anxiety, posttraumatic stress disorder (PTSD), and sleep disturbances were measured as psychological variables. Disability in basic activities of daily living (BADL), ambulation and frailty*

functional status
long term care
posttraumatic stress

were assessed as functional variables. Differences were analyzed in relation to level of comorbidity and test positivity for COVID-19. **Results:** *At baseline, residents with COVID-19 presented worse functionality, higher frailty levels and malnutrition risk compared to non-COVID-19 residents. At three-month follow-up, higher rates of clinically significant depressive symptoms (57.7%), anxiety symptoms (29.3%), PTSD symptoms (19.1%) and sleep disturbances (93.0%) were found among residents regardless of COVID status. Thus, among 215 residents, 101 (47%) experienced a decline in BADL from baseline to the 3-month follow-up (median functional loss = 5 points in Barthel Index). In multivariate analyses, COVID-19 status did not explain either the functional or the ambulation loss. By contrast, residents with low comorbidity and COVID-19 presented higher PTSD symptoms (effect 2.58; 95% CI 0.93 to 4.23) and anxiety symptoms (effect 2.10; 95% CI 0.48 to 3.73) compared to the low comorbidity/non-COVID19 group.* **Conclusion:** *COVID-19 pandemic was associated, after three-months, with high psychological impact in older adults in LTCFs., specifically with higher post-traumatic stress and anxiety symptoms. Functional decline did not differ in relation to COVID-19 status but could be related to isolation strategies used for pandemic control.* (Am J Geriatr Psychiatry 2022; 30:431−443)

Highlights

- **What is the primary question addressed by this study?**
  This study investigated the psychological and functional sequelae of the COVID-19 pandemic in older adults living in long term care facilities.
- **What is the main finding of this study?**
  The COVID-19 pandemic was associated with high 3-month rates of clinically significant symptoms of depression anxiety, posttraumatic stress disorder (PSTD), and sleep complaints in older LTCF residents. Those who tested positive for COVID-19 at baseline endorsed greater symptoms of (PTSD) and anxiety. Residents presented functional decline, regardless of COVID-19 status at baseline—possibly related to social isolation.
- **What is the meaning of the finding?**
  These results suggest that scheduled assessments and interventions aimed at reducing psychological impact and functional consequences may be a priority in older LTCF residents during a pandemic.

INTRODUCTION

Older adults, especially those living in nursing homes and long-term care facilities (LTCFs), have been disproportionately affected by COVID-19.[1] These settings have internationally accounted for higher incidence rates, higher morbidity outcomes and the highest mortality rates.[2] Institutionalized older adults are a particularly vulnerable population group for outbreaks due to key determinant factors for prognosis such as age, multimorbidity, disability, frailty, and other geriatric syndromes.[3,4] In addition, intrinsic characteristics of LTCFs, including structural barriers and space limits, high caregiving burden of workers, and organizational and policy-related factors may increase that vulnerability. Shortage and delay in diagnostic tests, lack of personal protective equipment, absence or replacement difficulties of health care workers, the poor prioritization and difficulties in infection control, as well as the lack of coordination with the health care system, could contribute to negative health care outcomes in these residents.[5]

Several guidelines and recommendations have been published with goals and aims for the prevention, control and management of COVID-19 in LTCFs.[6-10] These guidelines highlight the fact that health care should account not only for infection control but also for psychosocial and functional consequences of the COVID-19 pandemic on older adult residents, in order to implement strategies that minimize the negative impact on these health outcomes.

High COVID-19-related mortality rates in older adults at these institutions have been confirmed in previous studies. Older age, frailty, dementia, and multimorbidity have been described as independent risk factors for this outcome.[11-13] However, mortality could not be the most important outcome in this population. Quality of life, determined by functionality and psychological aspects like depression, anxiety, posttraumatic stress disorder or insomnia, could be just as important, if not more so, than mortality itself.[14] However, these outcomes have been poorly explored after pandemics in LTCFs. The psychological and emotional profiles of residents that have been described, suggest that high levels of loneliness, depression and exacerbation of behavioral and mood disturbances could be associated with social isolation measures applied during COVID-19 pandemic.[15] Additionally, high levels of depression and anxiety have also been found in residents with dementia during the pandemic.[16]

In March 2020, Spain suffered one of the worst COVID-19 outbreaks in the world, with 342,813 infected people, 10% of Europe confirmed cases, and 28,617 official deaths until August 2020. Specifically, Albacete, a city in the center of Spain where this study took place, was one of the most severely affected areas. The pandemic had a high impact on many of the 5,417 Spanish LTCFs, and lack of personal protective equipments or staff training were recognized as major issues. On March 24th, the Spanish Health Ministry published organizational rules and policies for the LTCFs during pandemics, including local authorities capacity to regulate the governance and health care of those institutions at risk. On March 7, a first COVID-19 resident was detected in a LTCF in Albacete. Health authorities were informed, and in agreement with Spanish government rules, all the LTCFs were closed to external visitors, residents were isolated, and the Geriatrics Department from referral hospital took medical control of these facilites.[2]

The high relevance of this problem and the scarcity of data make mandatory to search for reliable information and insight regarding psychological and functional outcomes in older adults in LTCFs after the COVID-19 pandemic. We hypothesize that after the first wave, higher rates of psychological and functional problems would be found in this population and consequently, after one year of isolation of these residents, strategies to reduce psychological, cognitive and functional decline should be a priority. For these reasons we aimed to analyze the psychological and functional outcomes of older adults in LTCFs in order to know epidemiologic data and risk factors that could help policy makers to develop optimum strategies, and that could lead health care workers to prioritize their assessment and social intervention strategies in pandemic scenarios.

METHODS

The COVID-A study is a cohort longitudinal study. From 953 residents included in the COVID-A study from five LTCFs in Albacete, 297 (31.2%) died in the first three pandemic months, and the 656 (68.8%) who were alive were assessed for eligibility. Finally, 215 (22.6%) residents met the inclusion criteria for this sub study, and 441 residents (46.3%) were excluded for different reasons. There were no significant differences between facilities regarding sociodemographic characteristics of their residents. Inclusion criteria were to live in one of the five LTCFs of Albacete city since the beginning of the pandemic, age ≥ 65 years old, ability to answer the questionnaires, and informed consent and availability to participate in the study. Exclusion criteria were moderate cognitive impairment (Global Deterioration Scale ≥ 5) in 296 residents (31.1%), age < 65 years in 63 (6.6%), transfer to other centers in 12 cases (1.3%), decline to participate in 19 cases (2.0%), and other reasons in 51 cases (5.4%), including poor general condition, aphasia, blindness, hospitalization, or inability to contact a legal representative that could give informed consent to participate. Figure 1 in supplementary material shows the flow chart of the COVID-A study.

Baseline data were collected at the beginning of the pandemic between March 2020 and June 2020, and 3-month follow-up data were collected between June 2020, and November 2020. Mean follow-up was

104 days (SD 21; range 64-153). Two trained geriatric specialist nurses, one nutritionist, one economist, and three medical residents in geriatric medicine collected clinical data through medical records review and personal interviews with residents in the selected LTCFs.

Functional variables assessed were disability in basic activities of daily living (BADL) measured with Barthel index score,[17] frailty status determined with the FRAIL instrument,[18] and ambulation measured with the Functional Ambulation Classification (FAC) from Holden.[19] Major chronic diseases and chronic treatments were retrieved from the medical records, and comorbidity was determined with the Charlson Comorbidity Index.[20] High comorbidity was considered when the Charlson Comorbidity Index score was ≥3 and low comorbidity score was considered when value was <3. Baseline diagnosis of COVID-19 was made based on positive SARS-CoV-2 polymerase chain reaction (PCR), positive serology or rapid antigen test. After baseline data collection, there were no new COVID-19 cases in the study population. Nutritional situation was assessed with the Mini Nutritional Assessment Short Form (MNA-SF).[21] Cognitive and affective status were evaluated with the Short Portable Mental Status Questionnaire Pfeiffer (SPMSQ)[22] and the 5-item Geriatric Depression Scale (GDS-5) from Yesavage,[23] respectively. Assessment of psychological impact included anxiety, determined with the anxiety subscale of the Hospital Anxiety and Depression Scale (HADS)[24] and posttraumatic stress disorder (PTSD), measured with the 8-item Treatment-Outcome Post-Traumatic Stress (TOP-8) scale.[25] Chronic sleep disturbances and insomnia were also determined using the Insomnia in the Elderly Scale (IES) tool, subscale A.[26] Finally, referral to the emergency department and hospitalization data were collected.

To analyze differences in psychological and functional variables, four phenotypes of residents were considered, depending on the level of comorbidity (high versus low or no comorbidity) and positivity for COVID-19. These four categories of residents were: "COVID-19 no or low comorbidity" (N = 53; 24.7%), "COVID-19 no or high comorbidity" (N = 22; 10.2%), "COVID-19 yes/ low comorbidity" (N = 88; 40.9%) and "COVID-19 yes/high comorbidity" (N = 52; 24.2%). This strategy was defined "a priori", because both conditions could potentially modify functional status and psychological variables in institutionalized older adults as it has been previously described.[3,4,15,16] Older adults with COVID-19 may have increased disability and psychological impacts after the pandemic, and these could be modulated by every individual comorbidity.

Regarding statistical analysis, Kolmogorov-Smirnov tests were conducted to analyze the normal or non-normal distribution of continuous variables. As most of them were non normal, we decided to make all the analyses with non-parametric statistic tests. Categorical variables are reported with their frequency distribution, and continuous variables with the median and interquartile range (IQR). Differences between groups were determined using chi-square tests for categorical variables, and U Mann-Whitney tests for the continuous ones. Median differences for related samples were determined using Wilcoxon rank tests. Statistical significance was established at alfa/p <0.05. Considering the asymmetrical distribution variables, we used General Linear Models (GLM) for multivariate analyses. Initially we used a saturated GLM with all the variables of interest because the standard errors of the GLMs did not adjust to a normal distribution, and after a selection process based on the Akaike's Information Criterion (AIC), the final model was achieved. The link function used was "identity" (gaussian family). COVID-19 or comorbidity variable was first analyzed using an omnibus test, and thereafter we included in the models the dummy variables with the 4 categories only when the overall test was significant. We used this approach to reduce Type I error risk associated to the performance of 6 different GLM, each of them using 4 different dummy variables. This would have implied many test hypothesis (18 tests) and therefore an increased risk of Type I error ($1-0.95^{18} = 0.6028$). Density plots for the main outcomes were created to visualize density scoring distributions using the geom-density function of the R package ggplot. Every analysis was performed using R statistical software, version 4.0.0 (R Foundation for Statistical Computing, Vienna, Austria), and the package ggplot2 (v3.3.1) for density graphs.

Our research was conducted in agreement with the Helsinki statement regarding human research. The study was approved by the local Ethics Review Committee, record 2020/04/039. Every participant signed an informed consent form prior to their inclusion in the study.

RESULTS

Table 1 shows baseline and 3-month follow-up features of the complete resident's sample, and from those with and without COVID-19, and Table 2 shows the comparisons of Barthel index, FAC, and Charlson index both baseline and at 3-month follow-up. The median age was 83 years, 62.8% were female, and 140 (65.1%) residents were COVID-19 confirmed cases. The most frequent medications were hypotensors, psychotropics and antiaggregants, without differences between COVID-19 and non-COVID-19 participants. In terms of health care resources consumption, COVID-19 residents were referred to the emergency department and hospitalized more frequently than those without COVID-19 (Table 1).

In relation to psychological variables, 124 (57.7%) participants presented GDS-5 scores ≥ 2 points suggesting clinically significant depressive symptoms, 63 (29.3%) residents presented HADS scores ≥ 11 points compatible with clinically significant anxiety symptoms, 41 (19.1%) presented TOP-8 scores ≥ 12 suggesting clinically significant PTSD symptoms, and 200 (93.0%) individuals presented IES-A scores > 2, indicating sleep disturbances. There were no differences between COVID-19 and non-COVID-19 participants for depressive symptoms or for sleep disturbances. However, residents with COVID-19 presented higher anxiety and PTSD symptoms than those that were not affected by COVID-19 (Table 1).

At baseline, 69.3% of the residents were dependent in at least one BADL. Residents with COVID-19 presented higher disability in BADL,

TABLE 1. Clinical Characteristics of the Residents in Long-Term Care Facilities at Baseline and 3-Months

Characteristic	Total sample (N = 215)	COVID-19		Comparison		
		Yes (N = 140)	No (N = 75)	χ^2 or U	df	p
BASELINE						
Age *Me (IQR)* U	83 (13)	84 (11)	82 (15)	4,558	-	0.111
Sex N*(%)* χ^2						
Female	135 (62.8)	89 (63.6)	46 (61.3)	0.105	1	0.746
Male	80 (37.2)	51 (36.4)	29 (38.7)		1	0.746
Chronic diseases N*(%)* χ^2						
Hypertension	169 (78.6)	111 (79.3)	58 (77.3)	0.111	1	0.739
Diabetes	75 (34.9)	47 (33.6)	28 (37.3)	0.304	1	0.581
Dementia	23 (10.7)	14 (10.0)	9 (12.0)	0.204	1	0.651
Cerebrovascular disease	46 (21.4)	35 (25.0)	11 (14.7)	3.101	1	0.078
COPD	48 (22.3)	32 (22.9)	16 (21.3)	0.065	1	0.798
Chronic consumed drugs N*(%)* χ^2						
Hypotensors	140 (65.1)	93 (66.4)	47 (62.7)	0.304	1	0.581
Oral anticoagulants	32 (14.9)	22 (15.7)	10 (13.3)	0.219	1	0.640
Antiagregants	57 (26.5)	39 (27.9)	18 (24.0)	0.373	1	0.541
Hypoglycemiants	50 (23.3)	28 (20.0)	22 (29.3)	2.384	1	0.123
Psychotropics	120 (55.8)	79 (56.4)	41 (54.7)	0.061	1	0.804
Oxygen therapy	35 (16.3)	24 (17.1)	11 (14.7)	0.220	1	0.639
Nutritional Supplementation	17 (9.2)	9 (7.8)	8 (11.4)	0.677	1	0.411
3-MONTH FOLLOW-UP						
FRAIL instrument *Me (IQR)* U	2 (1)	3 (1)	2 (2)	4,059	-	0.004
MNA-SF *Me (IQR)* U	9 (2)	9 (2)	10 (2)	4,249	-	0.019
SPMSQ (errors) *Me (IQR)* U	3 (3)	2 (3)	3 (3)	4,840	-	0.425
GDS-5 *Me (IQR)* U	2 (3)	2 (3)	2 (3)	4,583	-	0.184
TOP-8 *Me (IQR)* U	5 (8)	6 (8)	4 (6)	3,948	-	0.008
HADS *Me (IQR)* U	8 (8)	8 (7)	6 (7)	4,225	-	0.046
IES-A *Me (IQR)* U	9 (6)	9 (6)	9 (6)	4,897	-	0.564
3-MONTH USE OF RESOURCES						
Move to the ED N*(%)* χ^2	24 (11.2)	22 (15.7)	2 (2.7)	8.384	1	0.004
Hospitalization N*(%)* χ^2	16 (7.4)	16 (11.4)	0 (0.0)	9.261	1	0.002

Note: Data are displayed as medians (Interquartile Range) or number of participants (%). FAC: Functional Ambulation Classification; COPD: Chronic Obstructive Pulmonary Disease; CKD: Chronic Kidney Disease; MNA-SF: Mini Nutritional Assessment Short-Form; SPMSQ: Short Portable Mental Status Questionnaire Pfeiffer; GDS-5: Geriatric Depression Scale; TOP-8: The eight-item Treatment-Outcome Post-Traumatic Stress; HADS: Hospital Anxiety and Depression Scale; IES-A: Insomnia in the Elderly Scale-A; IES-B: Insomnia in the Elderly Scale-B; ED: Emergency Department; n, sample size; IQR: Interquartile Range; df, degrees of freedom; U: the Mann-Whitney U test; χ^2: chi-square test.

TABLE 2. A 3-Month Changes in Function and Comorbidity

Characteristic	Baseline COVID-19			Comparison		3-month follow-up COVID-19			Comparison		
	Total sample (N = 215)	Yes (N = 140)	No (N = 75)	U	p	Total sample (N = 215)	Yes (N = 140)	No (N = 75)	U	df	p
ABSOLUTE VALUES											
FAC Holden Me (IQR) U	4 (3)	3.5 (3)	4 (2)	3,927	0.002	4 (4)	4 (3)	4 (2)	4,069	-	0.005
Barthel index Me (IQR) U	75 (40)	67.5 (40)	85 (35)	3,746	0.001	70 (40)	65 (40)	80 (30)	3,744	-	0.001
Charlson Index Me (IQR) U	2 (2)	2 (2)	2 (2)	5,237	0.975	2 (2)	2 (2)	2 (2)	5,237	-	0.975
3-MONTH CHANGES											
Functional loss N(%) χ^2	-	-	-	-	-	101 (47)	62 (44.3)	39 (52)	1,167	1	0.280
Ambulation loss N(%) χ^2	-	-	-	-	-	45 (20.9)	29 (20.7)	16 (21.3)	0.011	1	0.915
Functional loss Me (IQR) U	-	-	-	-	-	0 (10)	0 (10)	5 (5)	5,133	-	0.780
Ambulation loss Me (IQR) U	-	-	-	-	-	0 (0)	0 (0)	0 (0)	5,194	-	0.881

Note: Data are displayed as medians (Interquartile Range) or number of participants (%). FAC: Functional Ambulation Classification; n: sample size; IQR: Interquartile Range; U: the Mann-Whitney U test

and worse ambulation than those who were not affected by COVID-19 (Table 2). Dependency in at least one BADL was present in 77.2% of the residents at 3-month follow-up. In addition, at this moment, we observed higher disability in BADL, worse ambulation, higher frailty levels, and higher malnutrition risk among residents with COVID-19, compared to those without it. 47% of residents underwent a decline in Barthel Index from baseline to three-month follow-up, indicating a functional loss. The median of this functional loss was 5 points in the Barthel Index for the complete sample (paired Wilcoxon rank test. Z=-4.936. p <0.001). Despite 45 (20.9%) residents showing an ambulation worsening after three months, there was no significant ambulation change between baseline visit and three-month follow-up. More so, there were no significant differences between COVID-19 and non-COVID-19 residents, either in three-month functional loss or in ambulation loss (Table 2). As a result, while COVID-19 residents were more functionally impaired at both time points, the degree of further loss did not differ from the non-COVID-19 group within the period. In addition, we could not find differences in the Charlson comorbidity index from baseline to three-month follow-up.

In multivariate analysis using GLM (Table 3), we could not find that any variable explained either the functional loss or the ambulation loss. Male residents showed a lower effect on PTSD symptoms, on anxiety symptoms, and on sleep disturbances than females. Furthermore, residents with low comorbidity and COVID-19 presented higher PTSD and anxiety symptoms compared to the reference category of low comorbidity or non-COVID-19 ones.

Figure 1 shows the graphics for density of 3-month functional loss for the four study groups. Functional loss showed a peak with a similar shape in every group, although those with high comorbidity without COVID-19, showed a right shifted curve towards a greater functional loss. However, no differences could be observed between the four groups regarding ambulation loss. Similarly, Figure 2 presents the density plots for psychological scale scores, including GDS-5, HADS, TOP-8, and IES-A. No differences could be observed for the different groups, either in the GDS-5 or in the IES-A. However, density of scores was higher in the HADS scale for those with COVID-

TABLE 3. General Linear Models of Functional and Psychological Variables at 3-Months

Variables	Functional loss	Ambulation loss	GDS-5	TOP-8 $R^2 = 0,098$ F (6,204)=3.68 p =0.001713	HADS $R^2 = 0,1016$ F (6,204)=3.845 p =0,001178	IES-A $R^2 = 0,03521$ F (6,206)=1.253 p =0.2807
	Effect (95% CI) (N = 215)	Effect (95% CI) (N = 215)	Effect (95% CI) (N = 215)	Effect (95% CI) (N = 215)	Effect (95% CI) (N = 215)	Effect (95% CI) (N = 215)
Age, ≥ 80 years	2.30 (-0.70 to 5.31)	0.14 (-0.08 to 0.37)	0.29 (-0.20 to 0.77)	-0.22 (-1.59 to 1.16)	1.10 (-0.25 to 2.45)	-0.37 (-1.52 to 0.77)
Male sex	-0.21(-3.20 to 2.78)	0.07 (-0.15 to 0.29)	-0.14 (-0.62 to 0.34)	-2.54 (-3.90 to -1.18)‡	-2.25 (-3.59 to -0.91)†	-1.44 (-2.57 to -0.30)*
Hospitalization	-0.54 (-5.98 to 4.90)	0.17 (-0.23 to 0.58)	0.56 (-0.31 to 1.44)	0.25 (-2.21 to 2.72)	0.09 (-2.34 to 2.51)	0.60 (-1.46 to 2.66)
COVID-19/Comorbidity						
-Omnibus test: df, F, Pr(>F)	F(3,221)=0.059, p =0.981	F(3,221)=0.116, p =0.951	F(3,209)=0.6, P=0.616	F(3,208)=2.72, p =0.0456	F(3,207)=2.389, p =0.0699	F(3,209)=0.398, p =0.754
-COVID-19 no/low Comorbidity				1.0 (reference)	1.0 (reference)	
-COVID-19 no/high Comorbidity				1.65 (-0.75 to 4.04)	0.98 (-1.38 to 3.34)	
-COVID-19 yes/low Comorbidity				2.58 (0.93 to 4.23)†	2.10 (0.48 to 3.73)*	
-COVID-19 yes/high Comorbidity				1.86 (0.01 to 3.71)	0.64 (-1.18 to 2.46)	

Note: Variables included in the saturated General Linear Model. The link function used was "identity" (gaussian family). CI: Confidence Interval; GDS-5: Geriatric Depression Scale; TOP-8: The eight-item Treatment-Outcome Post-Traumatic Stress; HADS: Hospital Anxiety and Depression Scale; IES-A: Insomnia in the Elderly Scale-A.
*p <0.05.
†p <0.01.
‡p <0.001.

19 and low or high comorbidity. Finally, in relation to TOP-8, those in the low comorbidity with COVID-19 group presented a right shifted density of scores compared to the other groups.

DISCUSSION

Table 4 presents the main findings of the COVID-A Study, and Table 5 the discussion of these main results. Overall, the main result of our study indicates that the COVID-19 pandemic has affected psychological aspects and functionality of institutionalized older adults without moderate-to-severe cognitive impairment. Regarding psychological aspects, residents presented high rates of clinically significant depressive, anxiety, and PTSD symptoms, and sleep disturbances. However, anxiety and PTSD symptoms were higher in those affected by COVID-19. Functional reduction was similar in those residents affected by COVID-19 compared to the group that did not suffer the disease, probably related to isolation measures. Older people in LTCFs have high rates of depression risk, ranging from 14%−82%, and with a median prevalence of 29.0% in a previous systematic review.[27] A recent study in older adults living in LTCFs in Mexico City yielded a prevalence of depressive symptoms of 39.3% using the GDS from Yesavage.[28] In our country, 44.7% of the residents living in LTCFs from Madrid (Spain) without severe cognitive

impairment suffered depression, 25.9% having been detected and 18.8% undetected.[29] Figures regarding depressive symptoms were higher in our sample than in previous studies, 57.7%. This suggests a high impact of COVID-19 on this outcome. Regarding anxiety disorder, a systematic review including 18 studies with 5,927 older adults in LTCFs, some of them using the HADS instrument, found that the rate of overall anxiety disorders ranged from 3.2%−20%, with a prevalence of 5%−5.7% in the highest quality ones.[30] In our study, 29.3% of the residents presented HADS scores compatible with anxiety disorder.

The prevalence of PTSD in older adult populations has been estimated to range between 1.5%−11.1%, although in special situations of experience-specific traumas, prevalence could be higher, up to 22.6%.[31-33] Data from our study may be comparable to figures associated to natural catastrophes, because 19.1% had TOP-8 scores suggesting PTSD. Finally, the prevalence of sleep disturbances was much higher in our sample than in previous reviews, 93% versus 50%,[34] although this large difference could rely on the instrument used for assessment.

One of the main consequences of the COVID-19 pandemic is that LTCFs have implemented infection control measures to protect residents from the virus spread. Although these measures have effectively reduced the risk of infection, the functional, mental, and other quality of life related consequences have not been well explored, and could originate a

FIGURE 1. Density curves for functional loss scores according to groups of COVID-19 and comorbidity at 3-months. For functional loss, most of COVID-19 residents (green and purple areas) did not present functional loss at 3-month follow-up (peak at Barthel index difference = 0 points). Most of COVID-19/High comorbidity residents (orange area) presented functional loss (peak at Barthel index difference = 5 points), and COVID-19 or Low comorbidity group (pink area) presented a bimodal functional loss (high peak at Barthel difference = 0 points, and low peak at Barthel difference = 5 points). Regarding ambulation loss, the four groups presented similar distributions, with most of the participants not losing ambulation (peak at FAC difference = 0 points), and some of them losing or improving 1 point. (Color version of figure is available online.)
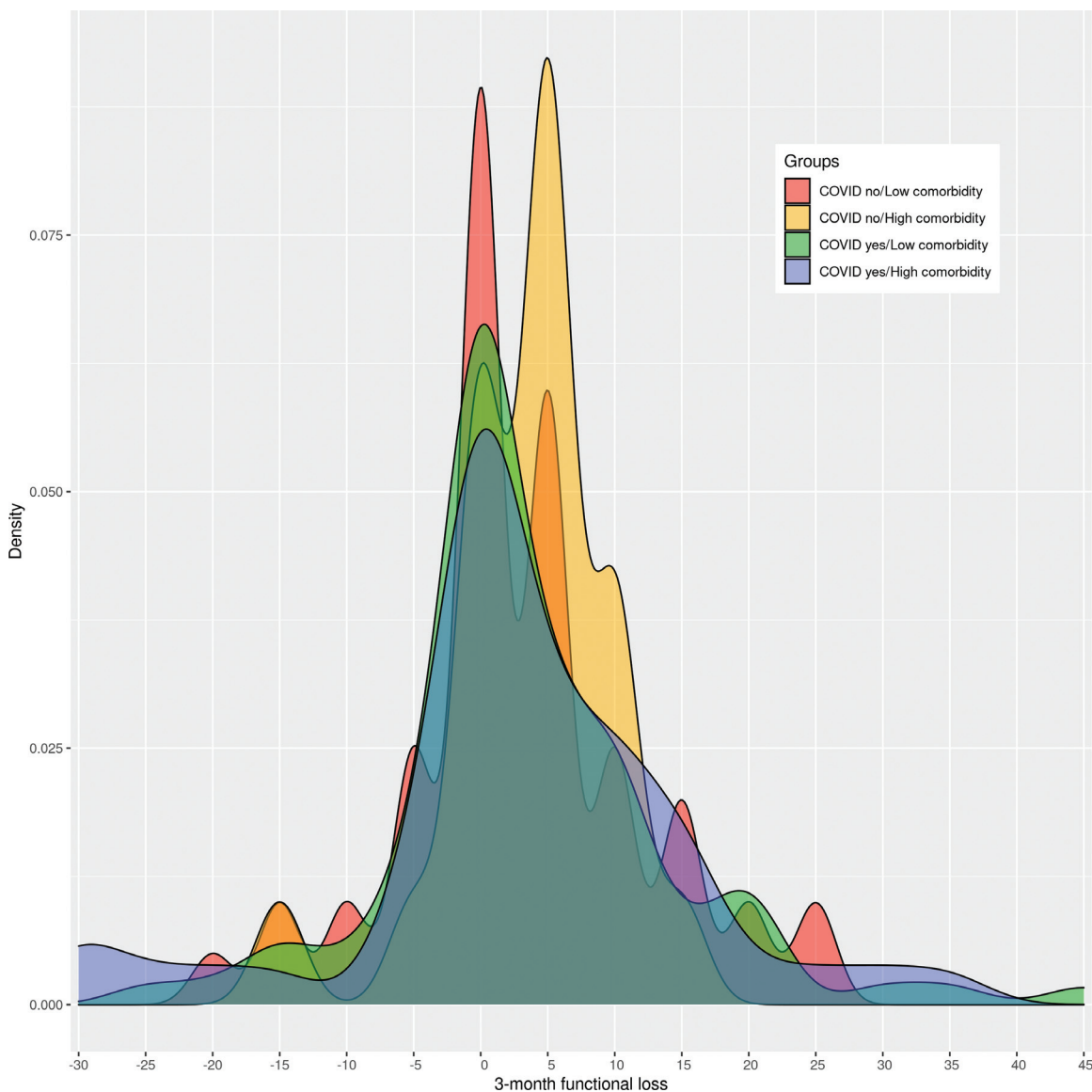
devastating impact on quality of life in this vulnerable population.[35-36] A recent scoping review of published research on the mental health impacts and potential strategies during COVID-19 showed that perceived isolation and social connections predicted depressive and anxiety symptoms, with a reverse and bidirectional pathway.[15,37] These psychological impacts could be explained by increases in cortisol levels, immunosenescence, body composition changes or sleep pattern changes.[38]

FIGURE 2. Density curves for depression risk, anxiety, post-traumatic stress and insomnia scores according to the groups of COVID-19 and comorbidity at 3 months. TOP-8: The eight-item Treatment-Outcome Post-Traumatic Stress. HADS: Hospital Anxiety and Depression Scale. IES-A: Insomnia in the Elderly Scale-A. For anxiety, most of COVID-19 residents (green and purple areas) presented higher scores in HADS scale (peaks at 7 and 8 points) than those without COVID-19 (orange and green areas) with peaks at 4 and 5 points. For PTSD, most of non-COVID-19 and COVID/High comorbidity residents (pink, orange and purple areas) presented lower scores in TOP-8 scale (peaks between 2 and 4 points) than those with COVID-19 or Low comorbidity (green area) with a bimodal peak at 2 and 11 points. Regarding depression risk and sleep disturbances, the four groups presented similar distributions, with scores in GDS between 1 and 5 points, and scores in IES-A between 5 and 14 irrespectively of the group considered. (Color version of figure is available online.)
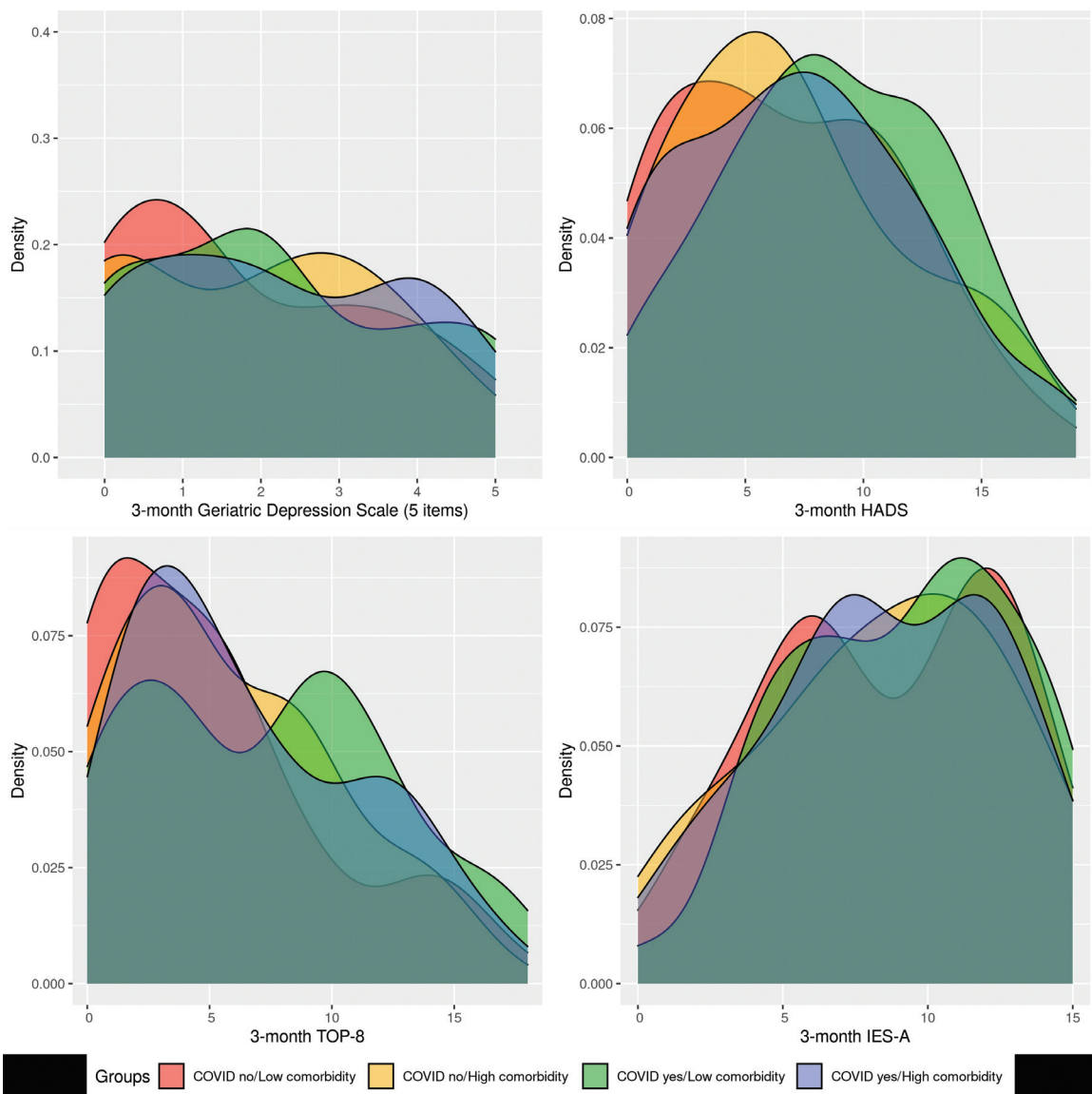
Widespread closure measures in the facilities have made hindered families to participate in care processes, consequently increasing social isolation that has contributed to a complex response from residents including functional decline, anxiety, depression, sleep disturbances and PTSD. Strict isolation due to restrictive visiting policies has contributed to communication challenges with the families, caregivers and

other residents, increasing the psychological and functional problems. It remarkable that COVID-19 patients with low medical comorbidity were more prone to higher PTSD and anxiety problems than the rest of participants. It could be hypothesized that in this group, with probably higher quality of life and increased life-long expectations, the absence of previous chronic medical conditions may reflect a higher susceptibility to psychological stressors like COVID-19, a decreased psychological resilience or an increased reporting of psychological distress. All these issues make plausible our observations, although our study is hypothesis-generating and not testing. In addition, clinical work in LTCFs during the pandemic, has confirmed the presence of psychological concerns and functional decline in older adults when isolated for COVID-19.

In a study involving 1,760 older residents of 57 nursing homes in eight countries, including residents with severe dementia, 50.6% of them experienced a 1-year functional decline in activities of daily living (ADL).[39] In our research, excluding residents with moderate-to-severe dementia, 47% of the sample had three-month functional loss using the Barthel Index. Pandemic-related functional loss at three months seems to be similar to that produced normally in a

TABLE 4. Main Results of COVID-A Study

- The prevalence of clinically significant depressive symptoms at 3 months after the beginning of the COVID-19 pandemic in older adults in institutions is 57.7%.
- The prevalence of clinically significant anxiety symptoms at 3 months after the beginning of the COVID-19 pandemic in older adults in institutions is 29.3%.
- The prevalence of clinically significant posttraumatic stress disorder symptoms at 3 months after the beginning of the COVID-19 pandemic in older adults in institutions is 19.1%.
- The prevalence of sleep disturbances at 3 months after the beginning of the COVID-19 pandemic in older adults in institutions is 93.0%.
- There are no differences between COVID-19 and non-COVID-19 residents for clinically significant depressive symptoms or for sleep disturbances.
- Residents with COVID-19 present higher clinically significant anxiety and posttraumatic stress symptoms than those that are not affected by COVID-19.
- Loss of function after 3 months from the beginning of the pandemic is present in 47% of the residents, with a median functional loss of 5 points in the Barthel Index.
- There are no differences in functional loss between COVID-19 and non-COVID-19 residents.
- Residents with low comorbidity and COVID-19 presented higher clinically significant posttraumatic stress disorder and anxiety symptoms compared to the low comorbidity or non-COVID19 group.

TABLE 5. Interpretation of the Main Results Presented in Table 4

- The prevalence of clinically significant depressive symptoms at 3 months after the COVID-19 pan demic in older adults in institutions is very high, almost double than that reported in a systematic review in this population before the pandemic.[27]
- The prevalence of clinically significant anxiety symptoms at 3 months after the COVID-19 pandemic in older adults in institutions is also high, almost 6-fold higher than that reported in a systematic review of high-quality studies in this population before the pandemic.[30]
- The prevalence of clinically significant posttraumatic stress disorder symptoms at 3 months after the COVID-19 pandemic in older adults in institutions is similar to that observed after natural catastrophes like earthquakes or hurricanes.[32-33]
- Almost every older adult in institutions presents sleep disturbances at 3 months after the COVID-19 pandemic, figure that is almost double than that reported in a previous review in this population before the pandemic.[34]
- Clinically significant depressive symptoms and sleep disturbances in this population after the pandemic may be related to the isolation process, or to the psychological stress produced by the pandemic,[37] but not to the individual effect of COVID-19, because figures are similar in those with and without COVID-19.
- High anxiety and posttraumatic stress symptoms may be related to the isolation process, or to the psychological stress produced by the pandemic, although COVID-19 produces higher levels probably related to individual physical or psychological processes.[35,36]
- The higher posttraumatic stress symptoms in those COVID-19 with previous low comorbidity, may be explained by a higher susceptibility to psychological stressors like COVID-19, a decreased psychological resilience, or an increased reporting of psychological distress in those with higher quality of life and increased life-long expectations.[35,36]
- Pandemic-related functional loss in the first three months seems similar to that produced normally in a 1-year follow-up without a pandemic situation.[39] This may be explained by the widespread closure regulations in the facilities, producing social isolation, mobility limitations, and limitations in exercise or rehabilitation programs. COVID-19 do not produce higher functional decline in this population, highlighting the negative consequences of isolation. However, high comorbidity increases the risk of functional decline, probably related to a lower physical resilience.[35,36]

1-year follow-up without a pandemic setting. However, it is possible that our results underestimate the rate of functional decline for two reasons. The first one is the exclusion of moderate-to-severe dementia residents, more vulnerable to functional decline, and the second is the fact that baseline functional measurement was conducted during the first days of the pandemic, and some residents may have disability in ADL due to the acute infectious process itself.

From our data, it seems that men could be less susceptible to psychological symptoms like anxiety, PTSD or insomnia. Previous research has identified several domains that could explain this gender differences between men and women in psychological symptoms, including brain structure, network connectivity, signal

transduction, transcription/translation, epigenetic changes, and hormonal changes during life course.[40,41]

This study has several limitations. First, we performed 5 different generalized linear models, each of which uses 4 different dummy variables. This implies a large number of tested hypothesis (18 tests) and therefore an increased risk of Type I error (1-0.95^{18}=0.6028). This risk was reduced by performing overall test for the COVID-19 or comorbidity variable versus each of the other variables of interest. Due to the observational design of the study, it is not possible to assume that functional decline was a consequence of psychological problems or of immobility secondary to isolation. Probably a close and parallel relationship between isolation, restrictions in mobility, and psychological issues may have produced the functional decline observed. It is also probable that there could be an underestimation of functional decline in our study as the baseline data collection was realized during the first wave of the pandemic, and at that time, many residents were in the acute phase of the disease. However, as previously stated, we could not find differences in functional decline during our follow-up between COVID and non-COVID residents, suggesting a deleterious effect of certain conditions other than the disease, mainly isolation, mobility restrictions or loss of social contacts.

The strengths of the study are the inclusion of almost all the LTCFs of Albacete city, and the majority of residents without moderate-to-severe cognitive impairment of these LTCFs, showing the external validity of our results. The research group was stable during the whole study, and interviews were made by trained professionals on-site, using validated tools for older adults. Finally, our study included the most vulnerable population group to COVID-19 adverse outcomes, usually poorly represented in clinical studies, providing data on psychological and functional impact of the pandemic in LTFCs.

CONCLUSIONS

The COVID-19 pandemic was associated with high rates at three months of psychological impacting older adults in LTCFs. In addition, those with previous COVID-19 had higher PTSD and anxiety symptoms. Residents presented functional decline that could not be explained by COVID-19 but which may

have been related to social isolation. Scheduled assessments during a pandemic and interventions aimed at reducing psychological and functional consequences may be a priority in older adults in LTCFs.

AUTHOR CONTRIBUTIONS

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DATA STATEMENT

The data has not been previously presented orally or by poster at scientific meetings.

SUPPLEMENTARY MATERIALS

Supplementary material associated with this article can be found in the online version at https://doi.org/10.1016/j.jagp.2022.01.007.

References

1. Comas-Herrera A, Zalakain J, Lemmon E, et al. Mortality associated with COVID-19 in care homes: international evidence. Article in LTCcovid.org, International Long-Term Care Policy Network, CPEC-LSE, 1st February 2021.

2. Mas Romero M, Avendaño Céspedes A, Tabernero Sahuquillo MT, et al: COVID-19 outbreak in long-term care facilities from Spain. Many lessons to learn. PLoS One 2020; 15:1–15; doi:10.1371/journal.pone.0241030

3. Bonanad C, García-Blas S, Tarazona-Santabalbina F, et al: The effect of age on mortality in patients with COVID-19: a meta-analysis with 611,583 subjects. J Am Med Dir Assoc 2020; 21:915–918;doi:10.1016/j.jamda.2020.05.045

4. de La Rica-Escuín M, González-Vaca J, Varela-Pérez R, et al: Frailty and mortality or incident disability in institutionalized older adults: The FINAL Study. Maturitas 2014; 78:329–334; doi:10.1016/j.maturitas.2014.05.022

5. Rada AG: Covid-19: The precarious position of Spain's nursing homes. BMJ 2020; 369:3–5;doi:10.1136/bmj.m1554

6. Blain H, Rolland Y, Schols JMGA, et al: August 2020 Interim EuGMS guidance to prepare European Long-Term Care Facilities for COVID-19. Eur Geriatr Med 2020; 11:899–913;doi:10.1007/s41999-020-00405-z

7. World Health Organization. Infection prevention and control in long-term care facilities in the context of COVID-19. Available at: https://apps.who.int/iris/bitstream/handle/10665/331643/WHO-2019-nCoV C_long_term_care-2020.1-spa.pdf?sequence=1&isAllowed=y

8. Centers for Disease Control and Prevention. Checklist for Nursing Homes and other Long-Term Care Settings. 2020. Available at: https://www.cdc.gov/coronavirus/2019-ncov/infection-control/control-recommendations.html

9. Centers for Disease Control and Prevention. Strategies to Prevent the Spread of COVID-19 in Long-Term Care Facilities (LTCF). 2020. Available at: https://www.cdc.gov/coronavirus/2019-ncov/healthcare-facilities/prevent-spread-in-long-term-carefacilities.html

10. Spanish Health Care Ministry. Government of Spain. Prevention and control guidelines against COVID-19 in nursing homes and other residential social services centres. Available at: https://www.mscbs.gob.es/profesionales/saludPublica/ccayes/alertasActual/nCov/documentos.htm

11. Bielza R, Sanz J, Zambrana F, et al: Clinical characteristics, frailty, and mortality of residents with COVID-19 in nursing homes of a region of madrid. J Am Med Dir Assoc 2020; 22:245–252; doi:10.1016/j.jamda.2020.12.003

12. De Smet R, Mellaerts B, Vandewinckele H, et al: Frailty and mortality in hospitalized older adults with COVID-19: retrospective observational study. J Am Med Dir Assoc 2020; 21:928–932; doi:10.1016/j.jamda.2020.06.008Gutiérrez

13. Rodríguez J, Montero Muñoz J, Jiménez Muela F, et al: Variables associated with mortality in a selected sample of patients older than 80 years and with some degree of functional dependence hospitalized for COVID-19 in a Geriatrics Service. Rev Esp Geriatr Gerontol 2020; 55:317–325; doi:10.1016/j.regg.2020.07.002

14. Dominguez-Rodriguez A, Gonzalez-Colaço Harmand M, Baez-Ferrer N, et al: Going beyond the mortality: the forgotten quality of life in the very elderly. J Am Med Dir Assoc 2018; 19:554–555; doi:10.1016/j.jamda.2018.03.008

15. Bethell J, Aelick K, Babineau J, et al: Social connection in long-term care homes: a scoping review of published research on the mental health impacts and potential strategies during COVID-19. J Am Med Dir Assoc 2021; 22:228–237;doi:10.1016/j.jamda.2020.11.025

16. El Haj M, Altintas E, Chapelet G, et al: High depression and anxiety in people with Alzheimer ' s disease living in retirement homes during the covid-19 crisis. Psychiatry Res 2020; 291:1–5; doi:10.1016/j.psychres.2020.113294

17. Mahoney FI, Barthel DW: Functional Evaluation: the Barthel Index. Md State Med J 1965; 14:61–65

18. Morley JE, Malmstrom TK, Miller DK: A simple frailty questionnaire (FRAIL) predicts outcomes in middle aged African Americans. J Nutr Health Aging 2012; 16:601–608;doi:10.1007/s12603-012-0084-2

19. Holden MK, Gill KM, Magliozzi MR, et al: Clinical gait assessment in the neurologically impaired. Reliability and meaningfulness. Phys Ther 1984; 64:35–40;doi:10.1093/ptj/64.1.35

20. Charlson M, Szatrowski T, Peterson J, et al: Validation of a combined comorbidity index. J Clin Epidemiol 1994; 47:1245–1251; doi:10.1016/0895-4356(94)90129-5

21. Kaiser MJ, Bauer JM, Ramsch C, et al: Validation of the Mini Nutritional Assessment short-form (MNA-SF): a practical tool for identification of nutritional status. J Nutr Heal Aging 2009; 13:782–788;doi:10.1007/s12603-009-0214-7

22. Pfeiffer E: A short portable mental status questionnaire for the assessment of organic brain deficit in elderly patients. J Am Geriatr Soc 1975; 23:433–441;doi:10.1111/j.1532-5415.1975.tb00927.x

23. Hoyl MT, Alessi CA, Harker JO, et al: Development and testing of a five-item version of the Geriatric Depression Scale. J Am Geriatr Soc 1999; 47:873–878;doi:10.1111/j.1532-5415.1999.tb03848.x

24. Zigmond AS, Snaith RP: The Hospital Anxiety and Depression Scale. Acta Psychiatr. scand 1983; 67:361–370;doi:10.1111/j.1600-0447.1983.tb09716.x

25. Davidson JR, Colket JT: The eight-item treatment-outcome post-traumatic stress disorder scale: a brief measure to assess treatment outcome in post-traumatic stress disorder. Int Clin Psychopharmacol 1997; 12:41–45;doi:10.1097/00004850-199701000-00006

26. Navarro B, López-Torres J, Andrés F, et al: Validation of the insomnia in the elderly scale for the detection of insomnia in older adults. Geriatr Gerontol Int 2013; 13:646–653;doi:10.1111/j.1447-0594.2012.00958.x

27. Seitz D, Purandare N, Conn D: Prevalence of psychiatric disorders among older adults in long-term care homes: a systematic review. Int Psychogeriatr 2010; 22:1025–1039;doi:10.1017/S1041610210000608

28. Velázquez-Alva MC, Irigoyen-Camacho ME, Cabrer-Rosales MF, et al: Prevalence of malnutrition and depression in older adults living in nursing homes in Mexico City. Nutrients 2020; 12:1–12;doi:10.3390/nu12082429

29. Damián J, Pastor-Barriuso R, Valderrama-Gama E, et al: Association of detected depression and undetected depressive symptoms with long-term mortality in a cohort of institutionalized older people. Epidemiol Psychiatr Sci 2017; 26:189–198;doi:10.1017/S2045796015001171

30. Creighton AS, Davison TE, Kissane DW: The prevalence of anxiety among older adults in nursing homes and other residential aged care facilities: a systematic review. Int J Geriatr Psychiatry 2016; 31:555–566;doi:10.1002/gps.4378

31. Préville M, Lamoureux-Lamarche C, Vasiliadis HM, et al: The 6-month prevalence of posttraumatic stress syndrome (PTSS) among older adults: Validity and reliability of the PTSS scale. Can J Psychiatry 2014; 59:548–555;doi:10.1177/070674371405901008

32. Pietrzak RH, Southwick SM, Tracy M, et al: Posttraumatic stress disorder, depression, and perceived needs for psychological care in older persons affected by Hurricane Ike. J Affect Disord 2012; 138:96–103;doi:10.1016/j.jad.2011.12.018

33. Chen G, Shen H, Chen G: A cross-sectional study on posttraumatic stress disorder among elderly qiang citizens 3 years after the wenchuan earthquake in china. Can J Psychiatry 2012; 57:547–553;doi:10.1177/070674371205700905

34. Neikrug AB, Ancoli-Israel S: Sleep Disturbances in Nursing Homes. J Nutr Health Aging 2010; 14:207–211;doi:10.1007/s12603-010-0051-8

35. Chu CH, Donato-Woodger S, Dainton CJ: Competing crises: COVID-19 countermeasures and social isolation among older adults in long-term care. J Adv Nurs 2020; 76:2456–2459;doi:10.1111/jan.14467

36. Stall NM, Johnstone J, McGeer AJ, et al: Finding the right balance: an evidence-informed guidance document to support the re-opening of canadian nursing homes to family caregivers and visitors during the coronavirus disease 2019 pandemic. J Am Med Dir Assoc 2020; 21:1365–1370;doi:10.1016/j.jamda.2020.07.038

37. Santini ZI, Jose PE, York Cornwell E, et al: Social disconnectedness, perceived isolation, and symptoms of depression and anxiety among older Americans (NSHAP): a longitudinal mediation analysis. Lancet Public Health 2020; 5:62–70;doi:10.1016/S2468-2667(19)30230-0

38. Cacioppo JT, Hawkley LC: Perceived Social Isolation and Cognition. Trends Cogn Sci 2009; 13:447–454;doi:10.1016/j.tics.2009.06.005

39. Fedecostante M, Onder G, Eusebi P, et al: Predictors of functional decline in nursing home residents: the shelter project. J Gerontol A Biol Sci Med Sci 2020; 75:1600–1605;doi:10.1093/gerona/glz296

40. Hodes GE, Epperson CN: Sex Differences in Vulnerability and Resilience to Stress Across the Life Span. Biol Psychiatry. 2019; 86(6):421–432;doi:10.1016/j.biopsych.2019.04.028

41. Sikes-Keilp C, Rubinow DR: In search of sex-related mediators of affective illness. Biol Sex Differ 2021; 12(1):55;doi:10.1186/s13293-021-00400-4