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Evolution of functional and mental status and quality of life in people aged 75 years and over after the COVID-19 pandemic in Spain: a prospective cohort study

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Abstract

The COVID-19 pandemic has had significant health and psychosocial consequences in the older adults. However, there is little community-based evidence that clearly distinguishes the effect attributable to SARS-CoV-2 infection to be differentiated from the contextual impact of the pandemic itself. The objective of this study was to describe the 18-month evolution of multidimensional domains of comprehensive geriatric assessment and to compare trajectories according to the presence or absence of confirmed infection at the start of follow-up.

Methods A prospective, multicenter cohort study was conducted in primary care across 11 Spanish regions. Non-institutionalized individuals aged 75 years and over recruited by trained nurses were included. Comprehensive geriatric assessments were performed at baseline and at 6, 12, and 18 months, including functional status, emotional state, nutritional risk, social support, and health-related quality of life. Exposure: confirmed SARS-CoV-2 infection documented by RT-PCR and/or rapid antigen testing recorded in the electronic health record from May 2020 until the time of inclusion in the study. Longitudinal trajectories and exposure time interactions were analyzed using linear mixed-effects models adjusted for relevant covariates, with sensitivity analyses based on complete-case analyses restricted to participants with complete follow-up.

Results A total of 1,072 participants were included at baseline. In the overall cohort, there were significant time effects indicating gradual worsening in most domains (functional capacity, nutritional status, social support, and quality of life). Trajectories were generally parallel between infected and uninfected individuals, with no consistent

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exposure time interactions, except for anxiety ($p=0.043$), which showed a differential pattern over time. Sensitivity analyses confirmed the robustness of the findings.

Conclusions In non-institutionalized adults aged 75 years or older, we observed a slight, progressive decline in overall health during the post-pandemic period, generally unrelated to prior COVID-19. Trajectories were similar between exposed and unexposed individuals, with the exception of anxiety, which showed a differential course by exposure status, underscoring the need for targeted monitoring of emotional health after infection. Public health responses to health or social crises should prioritize functional autonomy, social support, and mental health to preserve quality of life in this population.

Keywords COVID-19, Aged, 80 and over, Comprehensive Geriatric Assessment, Activities of Daily Living, Anxiety, Quality of Life, Cohort Studies

Background

Population ageing is a global trend with important implications for healthcare systems and for maintaining functional capacity and quality of life in older adults. Spain is among the countries with the highest proportion of older people, which adds further challenges in this context [1].

This demographic trend has been further challenged by the COVID-19 pandemic, which had a disproportionate impact on older adults in terms of mortality and medium- and long-term sequelae [2, 3]. Frailty, a geriatric syndrome characterized by a decline in functional reserve and increased vulnerability to adverse events, has been identified as a key risk factor during both the acute and post-infection phases, being associated with poorer recovery and higher complication rates [4].

Older adults may be at increased risk of vulnerability due to the frequent coexistence of disability, multimorbidity, and mental health problems. These factors, together with frailty, increase susceptibility to severe outcomes in infectious diseases such as SARS-CoV-2 infection, contributing to poorer prognosis and leading to its characterization as a geriatric emergency in this population [5, 6].

COVID-19 infection has been shown to negatively affect the functional capacity of older adults, with sustained functional decline, falling an average of 5.4 points on the Functional Independence Measure (FIM) scale one year after infection [7]. In addition, a deterioration in health perception, well-being, and quality of life during the pandemic, particularly among individuals with lower levels of physical activity [8].

Beyond the direct effects of infection, the pandemic context has also been associated with changes in daily routines and increased social isolation, contributing to higher levels of psychological distress among older adults [6].

Restrictions such as physical distancing, and lockdowns particularly affected this population, contributing to worsening outcomes in domains such as mobility, self-care, and mental health, highlighting the multidimensional impact of the pandemic and their role as important

risk factors for both physical and psychological morbidity [9, 10].

These findings highlight the need to establish long-term, comprehensive, and multidimensional follow-up of older adults who have had the disease, regardless of the severity of the initial condition, as well as to guide strategies for early intervention, prevention of the decline, and promotion of healthy ageing.

Although the acute effects of SARS-CoV-2 infection have been extensively studied, there are still significant gaps in the literature on its broader consequences for the physical, functional and emotional health of non-institutionalized older adults [11]. Recent studies highlight the need for approaches that consider the indirect effect of the pandemic on variables such as frailty, functional capacity, or mental health [12].

In this context, the objective of this study was to analyze the 18-month evolution of functional capacity, health perception and quality of life, frailty and mental health in non-institutionalized individuals aged 75 years or older, comparing trajectories according to the presence or absence of confirmed SARS-CoV-2 infection. As a secondary objective, we evaluated whether initial mental health and functionality influence the evolution of quality of life in this population group.

Materials and methods

Study design and setting

This study is part of the Cuidamos + 75 [13] project conducted in 11 Spanish regions: Andalusia, Balearic Islands, Canary Islands, Cantabria, Castile-La Mancha, Catalonia, Community of Madrid, Valencian Community, Murcia, Navarre, and Basque Country.

The project includes three sub-projects. The study presented here corresponds to sub-project 2 and follows a prospective longitudinal observational design in a population from the main project.

Research design/methodology

A prospective longitudinal observational study was conducted with structured follow-up using serial assessments, although without continuous event capture, in

two cohorts: one consisting of individuals with a history of SARS-CoV-2 infection and another consisting of individuals without such a history. Assessments were carried out at four points (baseline, 6, 12, and 18 months) in the primary care setting.

Population

The eligible population was identified from the electronic health records (EHRs) from the participating health services' primary care departments. The inclusion criteria were individuals aged 75 years or older, with at least one record in the EHR in the last half of 2019 and another one in the first half of 2022, not institutionalized, and providing informed written consent. Subjects with sensory deficits, cognitive impairment (identified through Pfeiffer screening), a Barthel activities of daily living (ADL) index ≤ 5 points, life expectancy ≤ 9 months, or patients with serious psychiatric conditions were excluded.

Sample size

Based on the estimation, the probability of a change in the Barthel ADL index of < 5 points at 18 months in the unexposed group (47%) [14] and this figure was considered to decrease by at least 10% in exposed patients. Considering a ratio of 2:1 between the sample sizes of the unexposed and exposed groups, for a CI of 95%, a power of 80%, and a dropout rate of 20%, the sample size was calculated to be 1,035 subjects (690 unexposed and 345 exposed). A randomized sampling by quotas for the included health centers in each of the regions was performed.

Recruitment

A total of 105 clinical nurses from the participating centers were recruited and trained. Then, from the previously selected sample each nurse received a randomized list of 20 possible participants from their health center, based on the overall population identified in the global project's HER [13], whom they proposed to participate in the study consecutively until they obtained 10 candidates for follow-up (seven unexposed and three exposed), after ensuring that they meet the inclusion and exclusion criteria.

The participating nurses received the preselected lists of patients obtained through sampling, stratified by age and sex, and carried out recruitment and follow-up in the healthcare center or at home. Quality protocols were established for data collection and transfer, and training and supervision of the field team was ensured.

Recruitment was carried out between June 2022 and June 2023. Data collection was performed at four time points: baseline, 6, 12, and 18 months, through in-person, home, or telephone assessments conducted by the clinical nurse who performed the recruitment. The data were

recorded in an electronic case report form (ECRF) implemented on the REDCap® platform, assigning a unique code to each participant and excluding personally identifiable information. The participant selection process and dropouts during follow-up are detailed in Fig. 1.

Variables

Outcome variables

Mental health (Hamilton Anxiety and Hamilton Depression scales), quality of life (EuroQol-5D-5L), functionality (measured with the Barthel index), ability to perform activities of daily living independently (Lawton and Brody scale), risk of falls (Downton Index), frailty (FRAIL questionnaire [15–18]), social support (measured using the Duke-UNC social support questionnaire [19, 20]) and nutritional status (MNA-SF questionnaire [17, 18]).

Exposure variable

SARS-CoV-2 infection confirmed by diagnostic testing (RT-PCR and/or rapid antigen test recorded in the HER) between 11th May 2020 and the recruitment start date.

Statistical analysis

Baseline characteristics were compared between participants who completed follow-up and those who dropped out using chi-square or Fisher's exact tests (qualitative) and Student's t-test (quantitative). Effect sizes were calculated to describe the magnitude of change at each follow-up time point relative to baseline, based on the standardized mean difference between measurements. Given the longitudinal design, these estimates should be interpreted as descriptive indicators of change rather than as formal effect size measures for inferential comparisons [21].

A general linear mixed-effects model was performed including time, exposure, and their interaction, adjusting for age, sex, and baseline values of each outcome. In addition, indicators of death and dropout (due to cognitive impairment or institutionalization) were included in the models as time-varying covariates to explore the potential influence of differential attrition patterns on the estimated trajectories, given the non-random nature of losses observed in this cohort. In this way, a significant interaction implies that the evolution over time of the dependent variable is different between exposed and unexposed individuals.

Finally, a general linear mixed-effects model with a random intercept was carried out, with the evolution of quality of life, measured with the EQ-5D-5L index, over four time points as the dependent variable. Time, sex, age, exposure to SARS-CoV-2, and baseline levels of the EQ-5D-5L index, functional capacity (Barthel index), Duke-UNC social support scale, and Hamilton scale

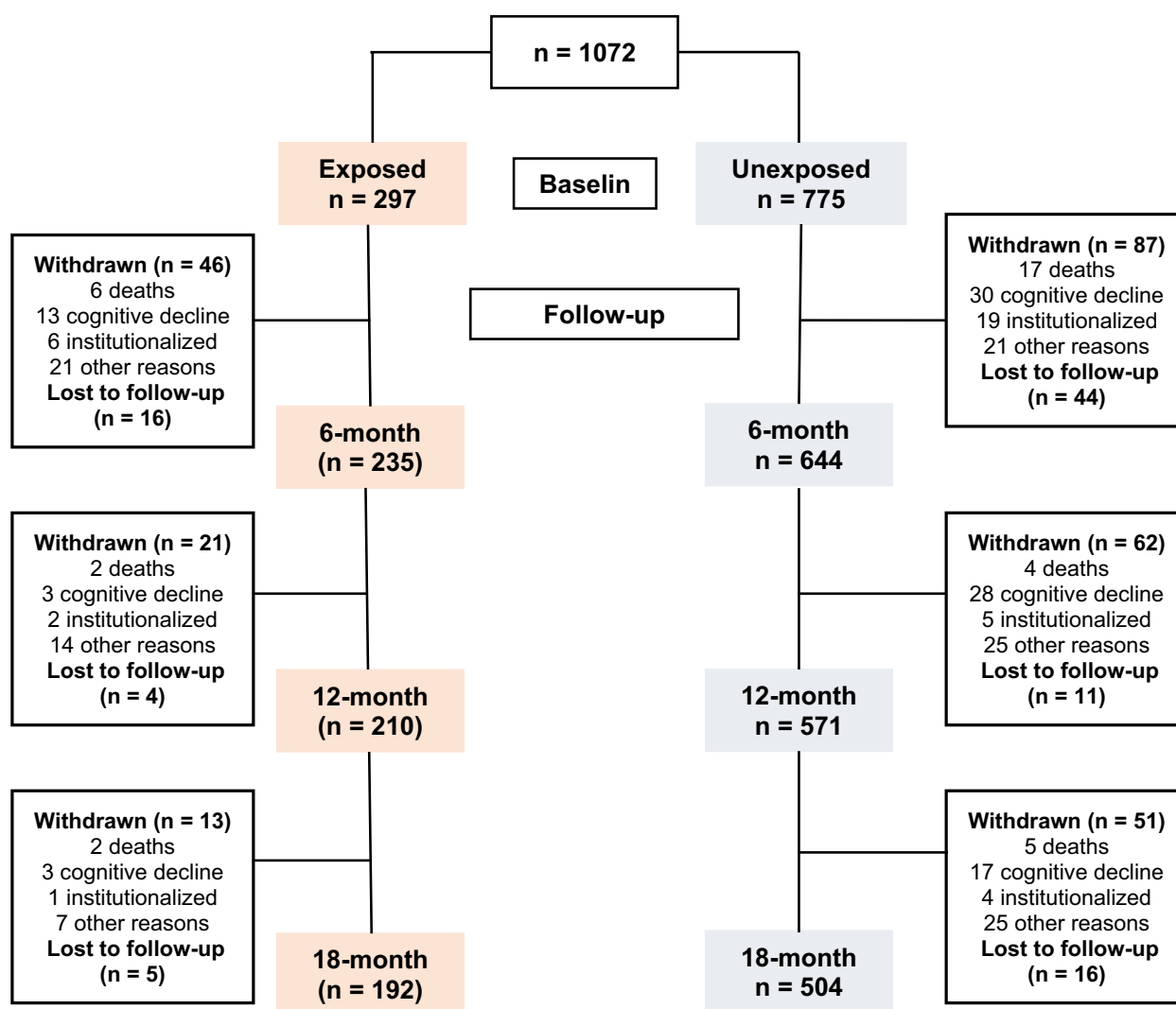


Fig. 1 Flowchart. Inclusion of participants and dropouts during study follow-up

anxiety and depression symptoms were included as fixed effects.

A sensitivity analysis based on complete-case analysis was performed by replicating all main models in the subsample of participants who completed the full follow-up, defined as those with complete data at all time points. This approach allowed us to assess the robustness of the findings to potential bias due to non-random loss to follow-up.

Additionally, in order to explore the potential impact of non-random losses during follow-up, variables related to dropout (institutionalization, cognitive impairment, or death) were included as additional covariates in the models rather than for causal adjustment. This approach was intended as a pragmatic strategy to account for potential informative dropout; however, it does not fully address non-random missingness, which is acknowledged as a limitation.

Results

Descriptive analysis of the sample at baseline

The baseline sample consisted of 1,072 participants (297 exposed, 775 unexposed), resulting in a higher proportion of unexposed individuals than initially planned due to the availability of eligible participants with prior SARS-Cov-2 infection. 59.7% were women, the mean age was 82.7 years (SD 4.4), most lived with others (72.0%) and presented multimorbidity (76.8% with two or more chronic conditions), but with no impact on functional dependence, with a mean value of 92.22 (SD 14.22) points on the Barthel index and 6.60 (SD 1.97) on the Lawton-Brody index. A moderate risk of falls was observed (Downton score of 1.88 points), adequate nutritional status (12.52 points on average on the Mini Nutritional Assessment-Short Form (MNA-SF)), and 1.16 (SD 1.18) points on the FRAIL scale. During follow-up, a total of

Table 1 Sociodemographic and clinic characteristics between exposed and nonexposed

	Exposed	Unexposed	p
	Mean (SD) n (%)	Mean (SD) n (%)	
Age	82.8 (4.3)	82.6 (4.4)	0.499
Live alone	69 (23%)	231 (30%)	0.032
Has a caregiver	121 (41%)	257 (33%)	0.020
Barthel index	91.28 (15.83)	92.58 (13.55)	0.212
Duke-UNC social support	46.20 (8.51)	46.41 (8.43)	0.717
Hamilton anxiety	6.69 (7.86)	6.20 (7.41)	0.354
Hamilton depression	4.88 (5.59)	4.36 (4.83)	0.158
Lawton and Brody scale	6.51 (2.08)	6.64 (1.93)	0.351
Downton Index	1.98 (0.96)	1.85 (0.99)	0.050
Frail index	1.30 (1.20)	1.10 (1.17)	0.014
MNA-SF	12.48 (1.88)	12.54 (1.84)	0.638
EQ-5D-5L index	0.78 (0.22)	0.81 (0.20)	0.041

SD standard deviation, MNA-SF Mini Nutritional Assessment-Short Form

376 losses (35.1%) were recorded, mainly due to dropout, institutionalization, or death (Fig. 1).

At baseline, participants with prior SARS-CoV-2 infection showed slightly worse scores in frailty and quality of life compared to unexposed individuals, while other variables were broadly comparable between groups. Overall, both cohorts presented relatively preserved functional status and similar sociodemographic characteristics (Table 1).

Comparison between participants who completed or did not complete the follow-up

Table 2 shows the baseline comparison between participants who completed follow-up and those who dropped out, according to sociodemographic characteristics and clinical follow-up variables. Significant differences were observed in age (82.4 vs 83.3 years, $p=0.001$) and comorbidity (74.7% vs 80.7%, $p=0.028$). In clinical variables, those who did not complete follow-up presented worse

Table 2 Sociodemographic characteristics between completed cases and missing values in baseline

	Total baseline		Follow-up completed		Follow-up not completed		p-value
	n	%	n	%	n	%	
Sociodemographic variables							
Sex							0.566
Women	635	59.7	409	59.1	226	60.9	
Men	428	40.3	283	40.9	145	39.1	
Age							0.036
< =82 years	593	55.5	401	57.9	192	51.2	
> 82 years	475	44.5	292	42.1	183	48.8	
Age (mean, SD)	82.7	4.4	82.4	4.1	83.3	4.9	0.001
Exposure							0.906
Yes	297	27.7	192	27.6	105	27.9	
No	775	72.3	504	72.4	271	72.1	
Home cohabitation status							0.381
Alone	300	28.0	189	27.2	111	29.7	
With others	770	72.0	507	72.8	263	70.3	
Comorbidity							0.028
< 2 chronic conditions	243	23.2	173	25.3	70	19.3	
> = 2 chronic conditions	804	76.8	511	74.7	293	80.7	
Polypharmacy							0.553
< 5 medications	304	28.5	202	29.1	102	27.3	
> = 5 medications	764	71.5	493	70.9	271	72.7	
Outcomes			Mean	SD	Mean	SD	
Functional Walking Capacity Scale	4.45	0.92	4.53	0.87	4.31	1	< 0.001
Barthel index	92.22	14.22	93.85	12.14	89.16	17.08	< 0.001
Duke-UNC social support	46.35	8.45	46.24	8.46	46.55	8.44	0.577
Hamilton anxiety	6.33	7.53	6.24	7.73	6.5	7.15	0.594
Hamilton depression	4.51	5.05	4.46	5.05	4.6	5.07	0.672
Lawton and Brody scale	6.60	1.97	6.85	1.71	6.14	2.32	< 0.001
Downton Index	1.88	0.98	1.85	0.94	1.95	1.04	0.122
Frail index	1.16	1.18	1.09	1.15	1.27	1.23	0.019
MNA-SF	12.52	1.85	12.63	1.81	12.32	1.91	0.008
EQ-5D-5L index	0.80	0.21	0.81	0.2	0.78	0.22	0.004

SD standard deviation, MNA-SF Mini Nutritional Assessment-Short Form

functional status (Barthel 89.16 vs 93.85; $p < 0.001$), less independence in instrumental activities (Lawton-Brody scale 6.14 vs 6.85; $p < 0.001$), greater frailty (Frail index 1.27 vs 1.09; $p = 0.019$), worse nutritional status (12.32 vs 12.63; $p = 0.008$) and lower quality of life (EQ-5D-5L index 0.78 vs 0.81; $p = 0.004$).

Evolution of outcome variables throughout follow-up

In the longitudinal analysis (Table 3), statistically significant changes were observed over time in most functional, clinical, and psychosocial indicators, with small effect sizes (Cohen's effect ranging from -0.20 to 0.12 in exposed individuals and from -0.20 to 0.13 in unexposed individuals). Frailty remained stable in the exposed group ($p = 0.172$), while in the unexposed group it increased significantly at 18 months ($d = 0.13$, $p < 0.001$). The exposed group showed lower Barthel functional capacity at baseline than the unexposed group (91.28 vs 92.58, respectively), with a greater decline over the three follow-ups in the unexposed group ($d = -0.06$ vs -0.04 ; -0.12 vs -0.05 ; -0.20 vs -0.11). However, the decline in functional capacity measured using the Lawton and Brody scale was more pronounced in the exposed group at 6 and 18 months ($d = -0.09$ vs -0.06 and -0.20 vs -0.15 , respectively) compared to the unexposed group.

Regarding the evolution of psychosocial factors, perceived social support (Duke-UNC) increased in the exposed group ($d = 0.10$), while it remained more constant in the unexposed group ($d = -0.02$). A statistically significant, although clinically irrelevant, improvement was observed in anxiety symptoms assessed using the Hamilton scale in exposed and unexposed individuals ($d = -0.06$ in both groups at 18 months). Depression showed a less consistent pattern, with slight changes and effect sizes close to zero. The EQ-5D-5L index increased at 6 months in the exposed group ($d = 0.12$), with a slight decrease at 18 months ($d = -0.02$). Meanwhile, in the unexposed group, a somewhat greater decrease was recorded at 18 months (from 0.81 to 0.79; $d = -0.08$).

Table 4 shows the mean evolution of all outcome measures over the 18 months in the cohort that completed follow-up. In general, the patterns observed are consistent with those described in the analysis of all cases, in terms of both the direction and the magnitude of the evolution of the scales. The effect sizes remained small to very small, with no substantial differences.

Impact of exposure to SARS-CoV-2 on the evolution of outcome variables

The adjusted mixed-effects model revealed a significant interaction between time and exposure on the evolution of anxiety symptoms measured with the Hamilton scale ($p = 0.043$), with a less pronounced improvement in anxiety symptoms in the exposed group compared to

the unexposed group. In contrast, the unexposed group showed a more sustained and pronounced improvement over time (Fig. 2). Table 5 shows that there were no statistically significant differences in anxiety levels at the first follow-ups between exposed and unexposed individuals (β time 6 months*exposure = -0.066 , $p = 0.113$; β time 12 months*exposure = -0.006 ; $p = 0.891$). However, a significantly greater reduction in anxiety was found in unexposed individuals compared to exposed individuals at 18 months (β time 18 months exposure = -0.115 ; $p = 0.012$).

Factors associated with changes in quality of life

The results of the mixed-effects linear regression model for the model with all cases (Table 6) showed a significant worsening of quality of life at 18 months compared to baseline ($\beta = -0.028$; $p = 0.002$), that exposure to COVID-19 was not significantly associated with the EQ-5D-5L index ($\beta = -0.006$; $p = 0.455$), and baseline EQ-5D-5L index values were maintained as the main predictor over time ($\beta = 0.187$; $p < 0.001$). Similarly, higher baseline scores on the Barthel index ($\beta = 0.054$; $p < 0.001$) was associated with higher quality of life. On the other hand, greater depression as measured by the Hamilton scale was associated with worse quality of life ($\beta = -0.013$; $p = 0.032$). The results were replicated in the cohort that completed the follow-up, showing similar results in the main indicators except for the Hamilton depression scale ($\beta = -0.010$; $p = 0.170$), which was not significantly associated with quality of life in the complete-case analysis. This discrepancy suggests that this association may be sensitive to sample composition. However, significant differences were found in Duke-UNC social support ($\beta = 0.009$; $p = 0.032$).

Discussion

This study provides longitudinal evidence on the evolution of functional status, mental health, and quality of life in a large cohort of older adults (≥ 75 years) living in the community, receiving primary care, with 18-month follow-up and comprehensive geriatric assessment. The comparison of trajectories between participants with and without confirmed SARS-CoV-2 infection at baseline allows us to assess whether exposure modifies the subsequent evolution of health and quality of life according to SARS-CoV-2 infection status.

Main findings

Health and quality of life were monitored using 10 validated clinical scales (functionality, instrumental activities, emotional health, nutrition, social support, risk of falls, and quality of life) in 1,072 non-institutionalized older adults over 18 months. A small but progressive decline was observed in most domains, both in those

Table 3 Mean evolution of outcome measures over time according to exposure to COVID-19 (All cases: complete and incomplete follow-up)

	Baseline			6 months			Cohen's d baseline vs 6 months			12 months			Cohen' d baseline vs 12 months			18 months			Cohen' d baseline vs 18 months	p-value*
	n	Mean (SD)		n	Mean (SD)				n	Mean (SD)				n	Mean (SD)					
Exposed																				
Barthel index	293	91.28 (15.83)		240	90.67 (16.89)		-0.04			206	90.44 (17.15)		-0.05			201	89.35 (18.50)		-0.11	<0.001
Duke-UNC social support	291	46.20 (8.51)		234	47.02 (7.88)		0.10			205	46.50 (8.92)		0.03			198	46.34 (8.61)		0.02	<0.001
Hamilton anxiety	289	6.69 (7.86)		237	6.76 (7.94)		0.01			205	6.08 (6.99)		-0.08			198	6.21 (7.97)		-0.06	<0.001
Hamilton depression	285	4.88 (5.59)		230	4.90 (5.34)		0.00			197	4.87 (5.13)		0.00			193	5.03 (5.88)		0.03	<0.001
Lawton and Brody scale	293	6.51 (2.08)		239	6.31 (2.21)		-0.09			205	6.30 (2.15)		-0.10			201	6.09 (2.20)		-0.20	<0.001
Downton Index	293	1.98 (0.96)		238	1.92 (0.97)		-0.07			206	1.92 (0.92)		-0.06			199	2.08 (0.98)		0.10	<0.001
Frail index	297	1.30 (1.20)		238	1.21 (1.20)		-0.07			205	1.30 (1.24)		0.01			201	1.41 (1.24)		0.09	0.172
MNA-SF	291	12.48 (1.88)		236	12.40 (1.94)		-0.04			205	12.50 (1.84)		0.01			200	12.49 (1.94)		0.01	<0.001
EQ-5D-5L index	297	0.78 (0.22)		272	0.80 (0.22)		0.12			233	0.80 (0.20)		0.11			219	0.77 (0.24)		-0.02	<0.001
Unexposed																				
Barthel index	771	92.58 (13.55)		643	91.79 (15.13)		-0.06			578	90.85 (15.10)		-0.12			538	89.39 (17.64)		-0.20	<0.001
Duke-UNC social support	764	46.41 (8.43)		635	46.28 (8.59)		-0.02			574	46.07 (9.28)		-0.04			539	46.28 (9.37)		-0.01	<0.001
Hamilton anxiety	765	6.20 (7.41)		638	5.87 (7.06)		-0.05			574	5.85 (6.94)		-0.05			537	5.73 (6.97)		-0.06	<0.001
Hamilton depression	753	4.36 (4.83)		619	4.20 (4.94)		-0.03			559	4.48 (5.21)		0.02			523	4.37 (4.93)		0.00	<0.001
Lawton and Brody scale	772	6.64 (1.93)		645	6.52 (2.02)		-0.06			578	6.43 (2.07)		-0.10			540	6.34 (2.18)		-0.15	<0.001
Downton Index	771	1.85 (0.99)		642	1.80 (0.99)		-0.05			576	1.87 (1.02)		0.02			540	1.95 (1.01)		0.10	<0.001
Frail index	772	1.10 (1.17)		642	1.10 (1.20)		-0.01			575	1.24 (1.22)		0.12			539	1.26 (1.21)		0.13	<0.001
MNA-SF	767	12.54 (1.84)		637	12.49 (1.89)		-0.03			577	12.50 (1.83)		-0.02			538	12.31 (1.88)		-0.12	<0.001
EQ-5D-5L index	775	0.81 (0.20)		703	0.82 (0.20)		0.05			632	0.80 (0.22)		-0.03			600	0.79 (0.24)		-0.08	<0.001

SD standard deviation, MNA-SF Mini Nutritional Assessment-Short Form

*, Linear mixed effects

Table 4 Mean evolution of outcome measures over time by exposure to COVID-19 (completed follow-up)

	Baseline		6 months	Cohen's d	12 months	Cohen's d	18 months	Cohen's d	p-value*
	n	Mean (SD)	Mean (SD)	base-line vs 6 months	Mean (SD)	baseline vs 12 months	Mean (SD)	baseline vs 18 months	
Exposed									
Barthel index	191	93.48 (12.24)	92.82 (13.57)	−0.05	91.78 (14.69)	−0.13	90.16 (17.13)	−0.22	< 0.001
Duke-UNC social support	190	46.58 (7.96)	47.60 (7.79)	0.13	46.96 (8.68)	0.05	46.41 (8.65)	−0.02	< 0.001
Hamilton anxiety	188	6.40 (7.82)	6.43 (7.91)	0.00	5.86 (7.01)	−0.07	5.88 (7.74)	−0.07	< 0.001
Hamilton depression	185	4.96 (5.84)	4.80 (5.70)	−0.03	4.75 (5.27)	−0.04	4.89 (5.83)	−0.01	< 0.001
Lawton and Brody scale	191	6.83 (1.67)	6.56 (1.96)	−0.15	6.42 (2.01)	−0.22	6.19 (2.14)	−0.33	< 0.001
Downton Index	192	1.90 (0.94)	1.88 (0.95)	−0.02	1.89 (0.92)	−0.01	2.06 (0.95)	0.18	< 0.001
Frail index	192	1.23 (1.19)	1.12 (1.18)	−0.09	1.28 (1.23)	0.04	1.38 (1.23)	0.12	0.028
MNA-SF	191	12.66 (1.81)	12.60 (1.82)	−0.03	12.54 (1.80)	−0.07	12.58 (1.90)	−0.04	< 0.001
EQ-5D-5L index	192	0.79 (0.21)	0.79 (0.21)	0.01	0.78 (0.20)	−0.06	0.76 (0.24)	−0.12	< 0.001
Unexposed									
Barthel index	504	93.99 (12.12)	92.57 (14.70)	−0.11	92.22 (13.70)	−0.14	90.31 (16.56)	−0.25	< 0.001
Duke-UNC social support	499	46.11 (8.65)	46.20 (8.64)	0.01	45.94 (9.38)	−0.02	46.28 (9.44)	0.02	< 0.001
Hamilton anxiety	500	6.18 (7.71)	5.38 (6.64)	−0.11	5.35 (6.74)	−0.12	5.51 (6.98)	−0.09	< 0.001
Hamilton depression	489	4.27 (4.71)	3.81 (4.66)	−0.10	4.10 (4.92)	−0.04	4.25 (4.89)	0.00	< 0.001
Lawton and Brody scale	504	6.85 (1.72)	6.71 (1.85)	−0.08	6.63 (1.88)	−0.12	6.46 (2.05)	−0.20	< 0.001
Downton Index	504	1.83 (0.95)	1.78 (0.95)	−0.06	1.82 (0.99)	−0.01	1.91 (0.96)	0.08	< 0.001
Frail index	503	1.04 (1.13)	1.04 (1.18)	0.00	1.17 (1.19)	0.11	1.24 (1.21)	0.17	< 0.001
MNA-SF	503	12.62 (1.81)	12.57 (1.84)	−0.03	12.62 (1.72)	0.00	12.36 (1.83)	−0.14	< 0.001
EQ-5D-5L index	504	0.82 (0.19)	0.82 (0.19)	0.00	0.80 (0.22)	−0.11	0.78 (0.24)	−0.22	< 0.001

SD standard deviation, MNA-SF Mini Nutritional Assessment-Short Form

*Linear mixed effects

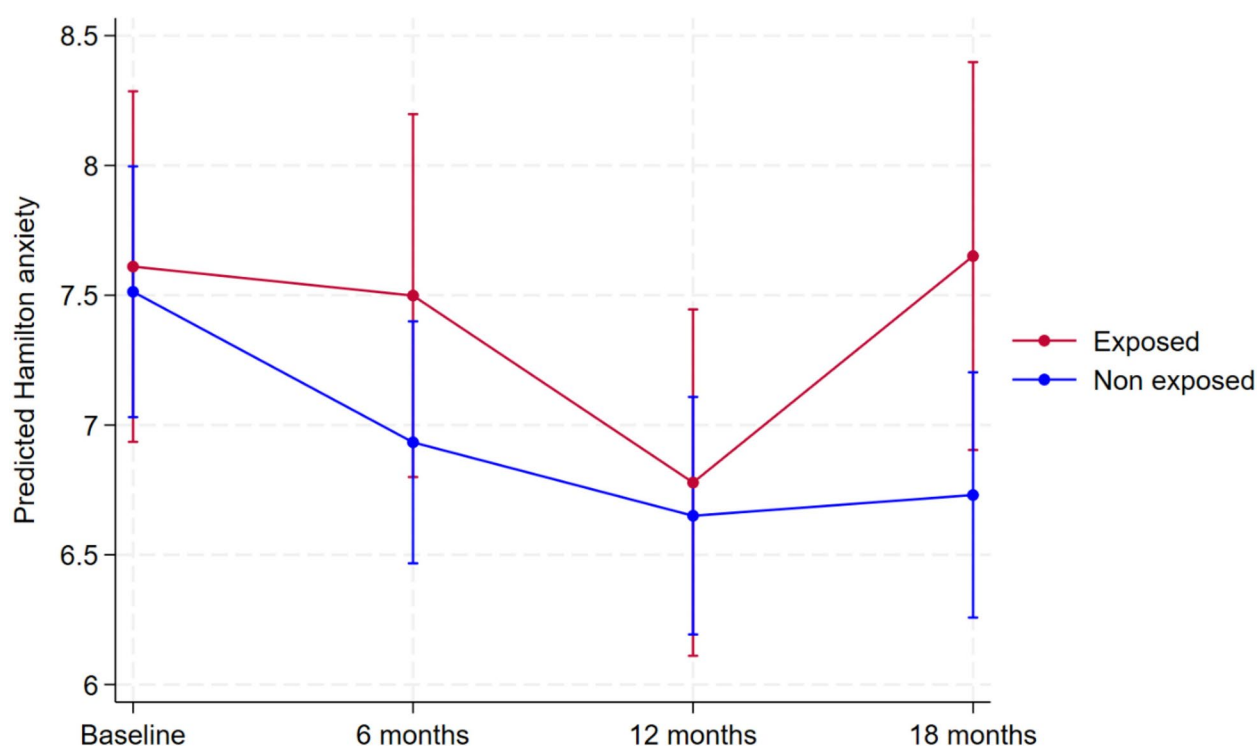
**Fig. 2** Hamilton Anxiety scale time*exposure interaction graph

Table 5 Hamilton anxiety linear mixed-effects model with time*exposure interaction

	ref: Exposed				ref: Unexposed			
	B	95% Confidence Interval	p-value		B	95% Confidence Interval	p-value	
time (ref:baseline)								
6 months	-0.015	-0.082	0.052	0.666	-0.080	-0.126	-0.035	0.001
12 months	-0.116	-0.191	-0.041	0.002	-0.122	-0.170	-0.074	< 0.001
18 months	0.005	-0.070	0.080	0.890	-0.110	-0.161	-0.060	< 0.001
Exposure	-0.013	-0.108	0.082	0.792	0.013	-0.108	0.082	0.792
time#exposure								
6 months#exposure	-0.066	-0.147	0.016	0.113	0.066	-0.016	0.147	0.113
12 months#exposure	-0.006	-0.095	0.083	0.891	0.006	-0.083	0.095	0.891
18 months#exposure	-0.115	-0.206	-0.025	0.012	0.115	0.025	0.206	0.012

*Models adjusted for sex, age, death, dropout due to cognitive impairment, dropout due to institutionalization, and Hamilton anxiety score at baseline

Table 6 Linear regression mixed effects of EQ-5D-5L

	Model with all cases				Model with completed follow-up cases			
	B*	95% Confidence Interval	p-value		B*	95% Confidence Interval	p-value	
Time (ref:baseline)								
6 months	0.008	-0.008	0.024	0.350	-0.007	-0.023	0.009	0.416
12 months	-0.004	-0.021	0.013	0.631	-0.024	-0.041	-0.008	0.003
18 months	-0.028	-0.045	-0.010	0.002	-0.050	-0.066	-0.033	0.000
Exposure (ref:yes)								
No	-0.006	-0.021	0.009	0.455	0.002	-0.016	0.020	0.830
Sex (ref:women)								
Men	0.014	0.000	0.027	0.049	0.012	-0.004	0.029	0.147
Age	-0.002	-0.009	0.005	0.514	-0.005	-0.014	0.004	0.244
EQ-5D-5L baseline	0.187	0.174	0.200	0.000	0.197	0.181	0.214	0.000
Hamilton anxiety baseline	0.004	-0.007	0.015	0.467	0.003	-0.009	0.016	0.604
Hamilton depression baseline	-0.013	-0.024	-0.001	0.032	-0.010	-0.024	0.004	0.170
Barthel index baseline	0.054	0.041	0.067	0.000	0.103	0.085	0.120	0.000
Duke-UNC social support baseline	0.006	-0.001	0.013	0.111	0.009	0.001	0.018	0.032

B* standardized beta

exposed and not exposed to SARS-CoV-2. The effect sizes were mostly small (Cohen's $d < 0.20$), suggesting small or clinically limited changes.

Sensitivity analysis based on complete-case analysis generally supported the main findings, although some differences were observed, particularly in the association between depression and quality of life, which was not consistent across models. The slight variations could be explained by the loss of statistical power resulting from sample reduction and survival bias (those who completed the follow-up presented better baseline health status).

The two cohorts start from similar, but not identical, health statuses. The previously published baseline analysis described comparable scores on the Barthel, social support (Duke-UNC), and anxiety (Hamilton Anxiety Rating Scale) scales, but worse scores on the frailty (Frail) and quality of life (EQ-5D-5L) scales in the exposed group.

Most domains showed small and progressive changes over time, with largely similar trajectories between exposed and unexposed individuals. Although exposed

individuals presented slightly worse baseline values on the Frail and EQ-5D-5L indices, the only statistically significant interaction between time and exposure was observed for the Hamilton Anxiety score, with unexposed individuals showing a somewhat greater improvement over the 18 months follow-up. However, the effect size was small, and this finding should be interpreted as exploratory.

Baseline scores on the EQ-5D-5L Index, Barthel Index, Duke-UNC questionnaire, and Hamilton Depression scale (only in the total cases model) were the main predictors of quality of life over time, independent of exposure to SARS-CoV-2 infection. Overall, these findings suggest that, in the post-pandemic context, changes in the health of older adults may be explained more by the aging process and contextual factors related to the pandemic period than by the infection itself. In this regard, exposure to SARS-CoV-2 infection does not appear to have a substantial or persistent impact on the trajectory of key health domains, which remained broadly compatible between groups. This pattern is consistent with

previous studies reporting changes in perceived well-being and quality of life among older adults during the pandemic period, largely associated with contextual factors [8].

Evolution of mental health

Although an improvement in anxiety symptoms was observed in both groups, the evolutionary pattern was different, being more stable in the exposed group. It should be noted that these trajectories could be influenced by the temporal context of data collection, which took place between June 2022 and December 2024, a period corresponding to the post-pandemic stage. When recruitment began in Spain, the New COVID-19 Surveillance Strategy (March 2022) was in force, in a “transition to the new normal” phase, with the gradual elimination of restrictions (mandatory quarantine, wearing masks), very high population vaccination coverage (>90%), and decongestion of the healthcare system [22, 23]. This period coincided with the end of the 7th wave (Omicron BA.4/BA.5), which had a very high rate of transmissibility but was less severe. This led to a gradual decline, reported in previous studies, in the perception of severity expressed by citizens regarding the possibility of becoming ill [24]. Fear of the disease was one of the key factors related to increased anxiety and depression levels in the general population in the early stages of the pandemic [25]. In addition to the fear of contracting the virus, there was the effect of restrictive measures and social isolation, the suffering caused by the deaths of loved ones, and economic concerns [26]. All of this led to an increase in anxiety, depression, and stress levels among the population in all age groups, as widely reported [27, 28]. Although this pandemic impact on mental health was universal, it has been observed that the older population reported fewer psychological symptoms during the pandemic as compared to younger people. This has been explained by greater adaptability and resilience in this age group, as well as because they were less affected by social isolation measures, event cancellations, or employment and financial instability [29]. These findings are consistent with the data reported in our sample, which show low overall anxiety and depression levels at all times.

However, both exposed and unexposed individuals experienced an improvement in anxiety symptoms and a slight improvement or stability in depression scores. This difference can be explained by the fact that anxiety is more sensitive to contextual changes related to the pandemic, i.e., containment and isolation measures and fear and uncertainty. In this sense, previous studies have found that anxiety correlates more strongly with fear of contagion than depression does. This suggests that the improvement observed in our sample may be dependent on the time of data collection and may be linked

to a decrease in the perception of COVID-19 risk and the lifting of epidemiological containment measures. In contrast, depression levels, though also low, appear to remain more stable during follow-up. This is consistent with previous studies, which reported a relative persistence of depressive symptoms after the pandemic, especially for older subjects with fewer social or economic resources [10]. In this sense, the difference between anxiety and depression seems to indicate that depression is more structural in nature, related to individual characteristics such as pre-existing vulnerability, functionality, social support, or losses and grief during the pandemic, and that, once present, it is more difficult to reduce.

Although both exposed and unexposed individuals showed patterns of improvement on the Hamilton Anxiety scale, the significant interaction between follow-up time and exposure to COVID-19 suggests that the trajectory of improvement is more stable and sustained in the unexposed group, while it is more unstable in the exposed group. One possible explanation for this is a potential residual effect of exposure or possible emotional sequelae associated with the experience of illness and associated isolation. Considering the greater vulnerability of the elderly population to the effects of infection, it is plausible that having fallen ill could have generated a persistent state of alertness or concern about health in this age group, making them more sensitive to small environmental changes or minor functional losses.

Quality of life and its determinants

The results of this study suggest that exposure to COVID-19 infection may have influenced health perceptions, mainly through the emotional and social context associated with the pandemic, rather than through a direct effect of the infection. This finding is consistent with previous studies that documented a significant decline in perceived well-being and quality of life among older adults following the pandemic [8].

Therefore, in relation to quality of life, a pattern of slight fluctuations independent of exposure to SARS-CoV-2 was observed. Although exposed individuals started with significantly worse scores than unexposed individuals on the EQ-5D-5L index, the trajectories were not significantly different. This suggests that the possible detrimental effect of infection on quality of life does not appear to persist over time or cause differential patterns of evolution. Pandemic containment measures have also been widely linked to a decline in the population's quality of life, due to their impact on loneliness, anxiety, depression, and overall life satisfaction, even in the absence of confirmed infection [8, 30]. In addition, people with a better quality of life before the pandemic maintained higher levels over time, even after illness or lockdown periods. This reinforces the hypothesis that preventive

and health promotion interventions should be implemented before significant functional or emotional decline occurs, enhancing individual and community resilience. From a geriatric perspective, the EQ-5D-5L has established itself as a useful tool not only for research but also for clinical practice, as it allows the impact of interventions to be monitored and guides personalized care plans in primary and community care [31].

Longitudinal multivariate analysis showed that exposure to SARS-CoV-2 was not a significant predictor of evolution in quality of life ($\beta = -0.006$; $p = 0.455$), reinforcing the hypothesis that the effects of the pandemic on the elderly population are explained more by social and emotional determinants than by the virus infection itself. Conversely, functionality, emotional state, and social support were consistent predictors of evolution in the EQ-5D-5L index over time. This pattern shows that quality of life in older adults depends primarily on the ability to maintain independence and social relationships, rather than on the presence or absence of disease. These results are consistent with those reported in European cohorts of older adults after the pandemic, where levels of well-being and health self-perception were more closely associated with isolation, loneliness, and frailty than with a history of SARS-CoV-2 infection [8, 10].

Multivariate analysis indicates the influence of mental health on the evolution of quality of life. Higher scores on the Hamilton anxiety and depression scales were associated with worse results on the EQ-5D-5L index, confirming the modulatory role of the emotional aspect on the perception of well-being. This relationship can be explained by the interaction between factors such as loneliness, fear of illness, loss of meaningful routines, and decreased social support, all of which affect both mental health and quality of life [32].

The results also reveal that anxiety levels may be associated with having been infected and the perception of quality of life, reinforcing the importance of addressing emotional health at this stage of life. This finding suggests that the infection could have acted as an emotional stressor in older adults, increasing anxiety or psychological distress, which in turn may be related to a poorer perception of health and well-being. In this sense, anxiety symptoms could potentially play a role in the relationship between exposure and quality of life. However, this should be considered and exploratory hypothesis, as no formal mediation analysis was conducted in this study. From a clinical point of view, this suggests that the effects of COVID-19 on quality of life are not solely biological, but may involve the interaction between emotional vulnerability, social environment, and functional reserve. Trajectories of functional capacity, frailty, nutritional status, and quality of life were largely similar between exposed and unexposed groups, suggesting a considerable degree

of resilience among older adults in the post-pandemic period. Therefore, the systematic assessment of mental health and the psychosocial context should be considered an essential part of a comprehensive approach to post-pandemic ageing, given its potential modulatory role in the trajectory of older adults' quality of life.

Community support acts as a social determinant of health in older adults, with positive effects on emotional state, adherence to treatment, and quality of life [33]. From a clinical practice perspective, early identification of a lack of such support should be a priority in primary care, as it is a modifiable factor that has a high impact on the prevention of physical and psychological decline.

From a public health perspective, supporting the family and community networks of older adults is key to helping them overcome the emotional impact left by the pandemic. The literature shows that older adults with strong social ties present a lower risk of anxiety and depression and a better health self-perception [33]. Therefore, promoting spaces for interaction, intergenerational programs, and adapted community activities can have a positive impact on emotional stability and, therefore, on improving quality of life. Consequently, the findings of this study reinforce the need to incorporate mental health and social support as central aspects in healthy ageing and post-COVID recovery programs.

The association observed between lower baseline depressive symptoms and better quality of life suggests the importance of early detection and management of mild affective symptoms in primary care. Similarly, evidence indicates that nursing interventions focused on promoting physical activity, encouraging social interaction, and emotional education are effective in preserving functionality and subjective well-being in vulnerable older adults [6, 34]. Taken together, the results of this study underscore the need for a comprehensive clinical approach that considers the interdependence between functionality, mental health, and social support as determinants of healthy ageing.

Functional capacity and frailty

With regard to functionality, both groups experienced progressive and sustained decline in both the Barthel Index (ADL) and the Lawton scale (instrumental activities of daily living (IADL)). The functionality scales show the largest effect sizes at follow-up (-0.11 and -0.20 in exposed individuals and -0.20 and -0.15 in unexposed individuals), substantially greater than the other scales. This finding is consistent with the high sensitivity of the ADL and IADL scales in capturing small clinically relevant changes [35]. Although previous studies reported a possible impact of SARS-CoV-2 infection on the functionality of infected older adults, causing persistent functional deficits [36, 37], in our case, no significant

interaction between follow-up time and exposure was observed for functionality scores. The authors hypothesized that older adults could suffer functional loss as a result of the infection due to a physiological effect (because of its frailty-inducing effect or the use of medications such as corticosteroids) and the effects of the associated quarantine. However, the vast majority of studies were conducted with populations hospitalized for COVID-19, or in the early stages of the pandemic, and it is possible that these functional losses were associated with more severe forms of the disease than those in our sample. In this regard, previous functional status was also considered a prognostic factor for the severity of COVID-19, and the functional sequelae of the disease were associated with more frail subjects and with having presented complications associated with the disease [38]. Considering that the vast majority of subjects in our sample were independent, it is possible that our sample fails to capture the functional sequela that the infection may leave in this age group, as patients with mild COVID-19 who were not hospitalized have shown a lower risk of adverse functional outcomes [39].

Frailty and risk of falls showed a slight and progressive but clinically insignificant worsening, which was similar between exposed and unexposed individuals. The results on these scales suggest that the decline may be due more to the natural ageing process, consistent with the follow-up time.

Previous studies have reported that measures to contain the COVID-19 pandemic have led to an increase in frailty in the elderly population, mainly due to decreased physical activity, social isolation, and reduced access to health and social care services [40, 41]. Similarly, physical deconditioning and the reorganization of social life and access to the healthcare system also posed a risk for an increase in falls, especially in vulnerable populations [42]. The results in our sample reinforce the theory that the impact in these aspects has depended more on the environmental context than on the disease itself and, therefore, it is possible that it has been reversed with the resumption of physical activity, social participation, and access to healthcare systems.

Likewise, the literature shows a possible frailty-inducing effect of the disease, as it constitutes a source of physiological stress and due to the associated containment measures. The infection has been shown to induce post-infection sarcopenia and a greater transition to pre-frail or frail states in individuals hospitalized for SARS-CoV-2 in the months following hospitalization [43, 44]. This frailty-inducing effect has been explained by several mechanisms: on the one hand, the infection can exacerbate the process of immunosenescence, promote endothelial damage and muscle degradation through mitochondrial dysfunction, which has a sarcopenic

effect; and on the other hand, preventive measures associated with the pandemic, such as home confinement, increased sedentary lifestyles, lack of social contact, and fear of becoming ill may also have a frailty-inducing effect. In addition, a significant number of infected older adults had to be hospitalized and potentially placed on mechanical ventilation, which also involves a potential frailty-inducing effect. Similarly, numerous studies conducted in the early stages of the pandemic assessed the impact on the quality of life of COVID-19 patients after recovery from hospitalization, finding a worse reported health-related quality of life compared to their uninfected controls [45].

Nutritional status

As for nutritional status, the changes observed were small, although it was noted that exposed individuals remained more stable while unexposed individuals reported a slight decline, although there was no significant interaction. Previous studies have indicated that several factors resulting from the pandemic (reduced access to fresh food or nutritional programs and health services) affected the nutritional status of vulnerable groups in particular [46]. The greater stability of exposed individuals in our sample could be explained by several reasons: the survival bias of exposed individuals, who may be more robust because they have overcome the infection, and, in addition, contact with the healthcare system due to the infection may have promoted better detection and management of their nutritional risk.

Strengths and limitations

Among the strengths of this study is its longitudinal and prospective design, which allowed us to describe the evolution of multiple dimensions of older adults' health over time after the pandemic, using validated, standardized instruments widely used in Comprehensive Geriatric Assessment in Primary Care. Data was collected in person or over the telephone by nurses trained in standardized data collection for this study, minimizing information bias and ensuring greater consistency in measurements. Furthermore, the large sample size and the inclusion of participants from various centers and 11 Spanish provinces ensure that the estimates obtained are representative.

The study provides a holistic view, combining functionality, emotional state, nutrition, frailty, risk of falls, social support, and quality of life, allowing for a more complete understanding of the post-pandemic impact on this vulnerable population.

In our study, we systematically used validated and standardized instruments that are widely recognized in Comprehensive Geriatric Assessment (CGA), which is essential for obtaining comparable and change-sensitive

results. This methodological approach is essential for holistically and comprehensively assessing the health status of older adults, considering not only their physical health but also other aspects related to their autonomy, mental health, and social relationships, in line with World Health Organization guidelines [47]. This comprehensive assessment provides insight into the overall health of the individual, moving away from the definition of health as the absence of disease and reflecting a combination of factors such as the individual's functional capacity, emotional well-being, and social integration. The variables measured in this study have been widely recognized as outcome variables of interest in the healthcare system for this population [48]. This evidence supports the importance of systematically incorporating validated measures of self-perceived health into follow-up in older adults, not only to identify the impact of critical events such as SARS-CoV-2 infection, but also to evaluate the effectiveness of interventions aimed at maintaining functionality and psychological well-being.

The collection of data from the multicenter study by trained nurses minimized measurement biases and provided internal consistency to the indicators, which translated into robust estimates.

However, some limitations must be considered for the correct interpretation of the data. First, the exposed cohort may be subject to survival bias, as those who survived SARS-CoV-2 infection may represent a more robust population subgroup with better functional reserve than those who did not, which could make the differences between groups less noticeable. Furthermore, we did not have access to pre-pandemic data for comparison, making it difficult to determine precisely how much of the observed decline corresponds to the natural ageing process and how much could be related to the social and health effects of the pandemic. It should be noted that some people did not complete the follow-up, and among them, those who were already more frail at the start were more likely to drop out. This may cause the results to underestimate the actual decline. In addition, no new COVID-19 infections were recorded during follow-up, nor was the severity of the initial infection, and it is possible that some people classified as uninfected may have had the infection without being diagnosed, which would reduce the differences between groups. However, the use of longitudinal mixed models, which explicitly incorporate measurement times and allow for modeling the individual trajectory of each participant and adjusting for intra-individual variability, partially mitigates this limitation by providing an estimate of the difference in trajectories between groups.

In addition, effect sizes were calculated for descriptive purposes, and the specific formulation of Cohen's d in a repeated-measures context may influence their

magnitude; therefore, these estimates should be interpreted with caution.

Moreover, multiple outcome models were tested without applying a correction for multiple comparisons, which may increase the risk of type I error. Therefore, the statistically significant findings, particularly those related to anxiety, should be interpreted with caution.

Conclusions

In non-institutionalized individuals aged 75 years or older, a slight and progressive decline was observed in multiple domains of comprehensive geriatric assessment, functionality, nutritional status, social support, and quality of life in the study population, occurring in parallel in both the group with a history of SARS-CoV-2 infection and the unexposed group.

Although several changes are statistically significant, their magnitude is generally small, pointing to a slow evolution toward greater vulnerability rather than an acute decline attributable to infection.

The only dimension with a differential pattern according to exposure is anxiety symptoms, underscoring the need to monitor and specifically address emotional health in the post-pandemic period.

The findings suggest that the post-pandemic impact on older adults is more related to contextual factors and baseline frailty/functionality than to the infection itself.

These findings reinforce the importance of functional status and emotional well-being as key determinants of maintaining quality of life in older adults after the pandemic or in future contexts of high-impact health or social crises and point to the need for intervention strategies focused on preserving autonomy, social support, and mental health in this age group.

Abbreviations

ADL	Activities of Daily Living
IADL	Instrumental Activities of Daily Living
CGA	Comprehensive Geriatric Assessment
EHR	Electronic Health Record
ECRF	Electronic Case Report Form
EQ-5D-5L	EuroQol 5-Dimensions 5-Levels index
FIM	Functional Independence Measure
MNA-SF	Mini Nutritional Assessment–Short Form
RT-PCR	Reverse Transcription Polymerase Chain Reaction

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Lozano, Cristina; Martín, Ángel; Martín, Susana; Más, Marta; Mateo, Ana; Miralles, Jerónima; Moreno, Maribel Noel, Rosa; Oter, Cristina; Otones, Pedro; Padilla, Jorge Rafael; Palmar, Ana M; Pastor, Monica; Pedraz, Azucena; Pisà, Marta; Reina, Gloria; Rich, Manuel; Sánchez-Ruano, Raquel; Romero, Esperanza M; Ruymán, Pedro; Sarabia, Carmen M; Solé, María; Taltavull, Joana Maria; Vicente, Sergio; Vidal, Clara. Avendaño Céspedes, Almudena. Cortés Zamora, Elisa Belén. Hidalgo Alsina, Gemma. Puig Fitó, Marta. Rami Badia, Maria Rosa. Obis Aguilar, María Eugènia. Guíu Bueria, Anna. Palau Morales, María Teresa. Fabregat Julvé, Inmaculada. Bernabeu Aicart, Clara. Mestre Tena, Juan Miguel. Tomas Brea, Marta. Parreño Membrado, María Dolores. Gimeno Escuder, Carla. Moliner Monedero, Ana. Cano Pérez, Alberto. Martínez Arroyo, Anunciación. Sánchez Ramos, Carmen Luzdivina. Regacho Ramírez, Carolina. Carretero Sierra, Consuelo. Villanueva Sanz, Cristina. Verdagay Romero, David. Ruiz García, Diego. Monteagudo García, Elena. Rojas Barra, Elena. Herrero Sancho, Elvira. Luna Espejo, Esther. Díez Rodríguez, Gema. Leyva Vera, Gloria. Nuevo Pozo, Gonzalo. Melero Redondo, Ines. Moreno García-Herrera, Inmaculada. Careaga González, Isabel. Villanova Cuadra, Laura. Ríos Ruiz, Lorena. Huerta Galindo, Luis. Almodovar López, María Ángeles. Hernández de Luna, María Concepción. Adillo Montero, María Isabel. Santamaría Martín, María Jesús. Romero Molina, María Luisa. Kamal Moreno, Nadia. Garrido Calleja, Paloma. Vadillo Obesso, Pedro. López Zarza, Raquel. Razola Rincón, Raquel. López Sánchez, Rocío. Lobato Márquez, Samuel. Criado Jorge, Sara. Morcillo de la Cuadra, Silvia. Susmozas Rodríguez Barbero, Teresa. Carpio Ibáñez, Ana María. García Gómez de Cadiñanos, Elena. Company Sancho, María Consuelo. Mendoza Sánchez, Rita. García Delgado, María José. Monzón Monzón, Guillermo. Díaz Díaz, María Isabel. Suárez Hernández, María Dolores. Candela Angulo, Beatriz. Martín Andrade, María Paula. Jorge Araujo, Pedro. Santana Aguiar, Eduardo. Morales Montesdeoca, Sandra. Figueroa Martín, Laura. Galdona Luis, Haridian. Martínez Mata, Silvia. Mellado Tirado, Rosa. Parrilla Suárez, Irene. Ramos Santana, Sara. Plasencia Delgado, Victoria. Rodríguez Hernández, Ingrid. Padilla Maestre, Jorge Rafael. Garrido Bollo, Sergio. Martínez de la Torre, Teresa. Guzmán Castilla, Inmaculada. Artieda Cadena, María. Ayesa Urtiaga, Vanesa. Berasain Errro, Itziar. Zubillaga Beorlegui, Anamaria. Ilundain Razquin, Graciela. Gutiérrez Pardo, María Carmen. Lucea Matinez, Maite. Magno Villanueva, Mónica. Martínez Zabarras, María de Leyre. Martínez Cabodevilla, María Jesús. Galán Espinilla, María José. Ariztegui Echenique, Ana María. Mateo Cervera, Ana María. Cidoncha Moreno, M^a Ángeles. Moreno Leal, Maribel. Barrenetxea Lejarreta, Ana Isabel. Albestegi Soto, Asier. Iglesias Domínguez, María Félix. Gallo Alcalá, Ruth. Carrera Alfonso, Elisabet. Pisà Gaia, Mara. Miralles Xamena, Jerónima. Sánchez Jiménez, Milagros. Barea Mestre, M. Josep. García Salom, Elena. García Duran, Nuria. Pons Burguera, Rosa María. Severi, William Andres. Gómez Bermejo, Tamara. Campos Guerrero, Ana Belén. Perelló Fuster, Marta. Hernandez Yeste, M. Soledad. Terrón Rodríguez, Elena. De la Rosa López, Laura. Cantos Garcia, Encarnación. Arjona Hernández, Fuensanta. De Castro Día, María Milagros. Polo Quiles, Pilar. Soriano Campos, Rita Isabel. Chumillas López, Josefa. Fernandez Abellan, Maria Jose. Valverde Jimenez, Maria Rosario. Muñoz García, Maria Jose. Cerezo Sanmartin, Margarita. Morales Nicolas, Dolores. Laveda Lopez, Maria Jose.

Trial registration

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No Generative AI was used in the preparation of this manuscript.

Authors' contributions

Study Management Committee: SES, JB, CVT, MCCS, MMC and MRB developed the framework of the study. All authors conceived the study and participated in its design. Coordination and Methodological Group: SES, JB, MPG, RSR, AMC, MACM, IFC, MMC, CCL, EA, JP, CB and MRB Writing Committee: SES, JB, AMC, MACM, CVT, MCCS, CCL wrote the manuscript; MPG, RSR, IFC, MMC, EA, JP, CB and MRB reviewed it. All authors in Cuidados + 75 Group read and approved the final manuscript.

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Data availability

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Declarations

Ethics approval and consent to participate

The study involving humans was approved by the Central Research Commission of Primary Healthcare Management of the Madrid Health Service and by the Ethics Committee for Drugs Research (CEIm) of University Hospital La Princesa in June 2022. All participating regions obtained approval from their respective research ethics committees. The study was conducted in accordance with the applicable ethical and legal requirements, including the principles of the Declaration of Helsinki (2024), the Oviedo Convention on Human Rights and Biomedicine, Regulation (EU) 2016/679 (General Data Protection Regulation), and Spanish Organic Law 3/2018 on Personal Data Protection and the guarantee of digital rights. All participants provided written informed consent before inclusion. Study data were collected and managed using standardized electronic case report forms implemented in REDCap®. Access to the database was restricted to authorized members of the research team through individual user credentials. The analytical database did not include directly identifiable personal information.

Consent for publication

Not Applicable. All data are presented in aggregated form and no identifying images or personal or clinical details of participants are included in this manuscript.

Competing interests

The authors declare no competing interests.

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References

- World Health Organization. Ageing and health. 2025. <https://www.who.int/news-room/fact-sheets/detail/ageing-and-health>. Accessed 4 Dec 2025.
- Fuentes Parrales JE, Castillo Vargas VN, LlininLlinin JM. Prevalencia de las secuelas post-covid en la calidad de vida e implicaciones físicas y psicológicas. *Arandu UTIC*. 2024;11:644–59. <https://doi.org/10.69639/ARANDU.V11I2.292>.
- Guterres A. Our response to COVID-19 must respect the rights and dignity of older people. United Nations. 2020. Disponible en: <https://www.un.org/en/coronavirus/our-response-covid-19-must-respect-rights-and-dignity-older-people>.
- June K, Adiebonye J, Christopher V, Fang L. Functional Limitations Associated with Frailty Risk in Older Adults Increased after COVID-19 Infection in 2020 CDC NHIS Data. *J Geriatr Med Gerontol*. 2022;8. <https://doi.org/10.23937/2469-5858/1510134>.
- Porcel-Gálvez AM, Badanta B, Barrientos-Trigo S, Lima-Serrano M. Elderly people, dependency and vulnerability in the coronavirus pandemic: an emergency for a social and health integration. *Enferm Clin*. 2021;31:S18–23. <https://doi.org/10.1016/J.ENFCLI.2020.05.004>.
- Pinazo-Hernandis S. Psychosocial impact of COVID-19 on older people: Problems and challenges. *Rev Esp Geriatr Gerontol*. 2020;55:249–52. <https://doi.org/10.1016/J.REGG.2020.05.006>.
- de Souza FCS, Laranjeira C, Salci MA, Höring CF, Góes HL de F, Baldissera VDA, et al. Functional Capacity Among Brazilian Older Adults 12 Months After COVID-19 Infection: A Cross-Sectional Study. *J Clin Med*. 2025;14. <https://doi.org/10.3390/JCM14010009>.
- Colucci E, Nadeau S, Higgins J, Kehayia E, Poldma T, Saj A, et al. COVID-19 lockdowns' effects on the quality of life, perceived health and well-being of healthy elderly individuals: A longitudinal comparison of pre-lockdown and lockdown states of well-being. *Arch Gerontol Geriatr*. 2022;99. <https://doi.org/10.1016/J.ARCHGER.2021.104606>.
- Joseph LM. Impact of COVID-19 on mental health and emotional well-being of older adults. *World J Virol*. 2022;11:129–36. <https://doi.org/10.5501/WJVV11.13.129>.
- Zaninotto P, Iob E, Di Gessa G, Steptoe A. Recovery of psychological well-being following the COVID-19 pandemic: a longitudinal analysis of the English longitudinal study of ageing. *Aging Ment Health*. 2025;29:651–9. <https://doi.org/10.1080/13607863.2025.2450260>.
- Lebrasseur A, Fortin-Bédard N, Lettre J, Raymond E, Bussièrès EL, Lapierre N, et al. Impact of the COVID-19 pandemic on older adults: Rapid review. *JMIR Aging*. 2021;4. <https://doi.org/10.2196/26474>.
- García-Esquinas E, Ortolá R, Gine-Vázquez I, Carnicero JA, Mañas A, Lara E, et al. Changes in health behaviors, mental and physical health among older adults under severe lockdown restrictions during the covid-19 pandemic in Spain. *Int J Environ Res Public Health*. 2021;18. <https://doi.org/10.3390/IJERPH18137067>.
- Rico-Blázquez M, Esteban-Sepúlveda S, Sánchez-Ruano R, Ariztegui-Eche-nique AM, Artigues-Barbera EM, Brito-Brito PR, et al. Impact of the COVID-19 pandemic on the self-care and health condition of the older adults. *CUIDA-MOS+75. A mixed methods study protocol*. *Front Public Health*. 2024;12. <https://doi.org/10.3389/FPUBH.2024.1389641>.
- Ferrer A, Formiga F, Sanz H, Monserrat E, Verges D. Successful aging and indicators of frailty in the elderly. *Octabaix Stud Aten Primaria*. 2014;46:475–82. <https://doi.org/10.1016/J.APRIM.2014.01.004>.
- Jung H-W, Yoo H-J, Park S-Y, Kim S-W, Choi J-Y, Yoon S-J, et al. The Korean version of the FRAIL scale: clinical feasibility and validity of assessing the frailty status of Korean elderly. *Korean J Intern Med*. 2016;31:594–600. <https://doi.org/10.3904/kjim.2014.331>.
- Díaz de León González E, Gutiérrez Hermosillo H, Martínez Beltrán JA, Chavez JHM, Palacios Corona R, Salinas Garza DP, et al. Validation of the FRAIL scale in Mexican elderly: results from the Mexican Health and Aging Study. *Aging Clin Exp Res*. 2016;28:901–8. <https://doi.org/10.1007/s40520-015-0497-y>.
- Castro-Vega I, Veses Martín S, Cantero Llorca J, Salom Vendrell C, Bañuls Morant C, Hernández Mijares A. Validación del cribado nutricional "Malnutrition Screening Tool" comparado con la Valoración Nutricional Completa y otros cribados en distintos ámbitos socio-sanitarios. *Nutr Hosp*. 2018. <https://doi.org/10.20960/nh.1619>.
- Rubenstein LZ, Harker JO, Salva A, Guigoz Y, Vellas B. Screening for under-nutrition in geriatric practice: developing the Short-Form Mini-Nutritional Assessment (MNA-SF). *J Gerontol A Biol Sci Med Sci*. 2001;56:M366–72. <https://doi.org/10.1093/gerona/56.6.M366>.
- De la Revilla AL, Bailón Muñoz E, Medina MI. Validación de una escala de apoyo social funcional para su uso en la consulta del médico de familia. *Aten Primaria*. 1991;8(9):688–92.
- Broadhead WE, Gehlbach SH, De Gruy FV, Kaplan BH. The Duke UNC Functional Social Support Questionnaire. *Med Care*. 1988;26:709–23. <https://doi.org/10.1097/00005650-198807000-00006>.
- Sullivan GM, Feinn R. Using effect size—or why the P value is not enough. *J Grad Med Educ*. 2013;4:279–82. <https://doi.org/10.4300/JGME-D-12-00156.1>.
- Comisión de Salud Pública del Consejo Interterritorial del Sistema Nacional de Salud. estrategia de vigilancia y control frente a covid-19 tras la fase aguda de la pandemia. Madrid; 2022.
- World Health Organization. From emergency response to long-term COVID-19 disease management: sustaining gains made during the COVID-19 pandemic. 2023. <https://www.who.int/publications/i/item/WHO-WHE-SPP-2023.1>. Accessed 26 Mar 2025.
- Falcón-Romero M, Rodríguez-Blázquez C, Romay-Barja M, Forjaz MJ. Evolution of the concerns, perceptions and attitudes of the Spanish population during the COVID-19 pandemic. *Revista Española de Sociología*. 2023;32:1–14. <https://doi.org/10.22325/FES/RES.2023.162>.
- Caycho-Rodríguez T, Tomás JM, Vilca LW, Carbajal-León C, Cervigni M, Gallegos M, et al. Socio-Demographic Variables, Fear of COVID-19, Anxiety, and Depression: Prevalence, Relationships and Explanatory Model in the General Population of Seven Latin American Countries. *Front Psychol*. 2021;12. <https://doi.org/10.3389/FPSPY.2021.695989>.
- World Health Organization. COVID-19 pandemic triggers 25% increase in prevalence of anxiety and depression worldwide. 2022. <https://www.who.int/news/item/02-03-2022-covid-19-pandemic-triggers-25-increase-in-prevalence-of-anxiety-and-depression-worldwide>. Accessed 24 Nov 2025.
- Xiong J, Lipsitz O, Nasri F, Lui LMW, Gill H, Phan L, et al. Impact of COVID-19 pandemic on mental health in the general population: a systematic review. *J Affect Disord*. 2020;277:55–64. <https://doi.org/10.1016/J.JAD.2020.08.001>.
- Silva C, Fonseca C, Ferreira R, Weidner A, Morgado B, Lopes MJ, et al. Depression in older adults during the COVID-19 pandemic: A systematic review. *J Am Geriatr Soc*. 2023;71(7):2308–25. <https://doi.org/10.1111/jgs.18363>.
- Rossi R, Jannini TB, Socci V, Pacitti F, Lorenzo G Di. Stressful Life Events and Resilience During the COVID-19 Lockdown Measures in Italy: Association With Mental Health Outcomes and Age. *Front Psychiatry*. 2021;12. <https://doi.org/10.3389/FPSPY.2021.635832>.
- Nshimirimana DA, Kokonya D, Gitaka J, Wesonga B, Mativo JN, Rukanikigitero JMV. Impact of COVID-19 on health-related quality of life in the general population: A systematic review and meta-analysis. *PLOS Global Public Health*. 2023;3. <https://doi.org/10.1371/JOURNAL.PGPH.0002137>.
- Marten O, Brand L, Greiner W. Feasibility of the EQ-5D in the elderly population: a systematic review of the literature. *Qual Life Res*. 2022;31:1621–37. <https://doi.org/10.1007/S11136-021-03007-9>.
- Agrawal S, Makuch S, Drózd M, Strzelec B, Sobieszczańska M, Mazur G. The impact of the covid-19 emergency on life activities and delivery of healthcare

- services in the elderly population. *J Clin Med*. 2021;10. <https://doi.org/10.3390/JCM10184089>.
33. Simón-Melchor A, Jiménez-Sesma ML, Solano-Castán J, Simón-Melchor L, Ferrer-Sorolla D, Bordonaba-Bosque D. Health perception among older adults according to lifestyle and functional capacity. *Enfermería Global*. 2023;22:234–49. <https://doi.org/10.6018/EGLOBAL.559401>.
 34. Volkert D, Beck AM, Cederholm T, Cruz-Jentoft A, Goisser S, Hooper L, et al. ESPEN guideline on clinical nutrition and hydration in geriatrics. *Clin Nutr*. 2019;38:10–47. <https://doi.org/10.1016/j.clnu.2018.05.024>.
 35. González N, Bilbao A, Forjaz MJ, Ayala A, Orive M, García-Gutiérrez S, et al. Psychometric characteristics of the Spanish version of the Barthel index. *Aging Clin Exp Res*. 2018;30:489–97. <https://doi.org/10.1007/S40520-017-0809-5>.
 36. Bae S, Malcolm MP, Nam S, Hong I. Association between COVID-19 and activities of daily living in older adults. *OTJR Occup Ther J Res*. 2023;43:202–10. <https://doi.org/10.1177/15394492221134911>.
 37. Rodríguez-Sánchez I, Rodríguez Mañas L. COVID in older people: some answers, new questions. *J Nutr Health Aging*. 2023;27:79–80. <https://doi.org/10.1007/S12603-023-1891-3>.
 38. Capin JJ, Wilson MP, Hare K, Vempati S, Little CE, McGregor D, et al. Prospective telehealth analysis of functional performance, frailty, quality of life, and mental health after COVID-19 hospitalization. *BMC Geriatr*. 2022;22. <https://doi.org/10.1186/S12877-022-02854-6>.
 39. Prampart S, Le Gentil S, Bureau ML, Macchi C, Leroux C, Chapelet G, et al. Functional decline, long term symptoms and course of frailty at 3-months follow-up in COVID-19 older survivors, a prospective observational cohort study. *BMC Geriatr*. 2022;22. <https://doi.org/10.1186/S12877-022-03197-Y>.
 40. Mete B, Tanir F, Demirhindi H, Inaltekin A, Kanat C, Mete B, et al. Impact of the COVID-19 Pandemic on Frailty in Older Adults. *Eur J Geriatr Gerontol*. 2022;4:79–84. <https://doi.org/10.4274/EJGG.GALENOS.2022.2021-11-1>.
 41. Shinohara T, Saida K, Tanaka S, Murayama A, Higuchi D. Did the number of older adults with frailty increase during the COVID-19 pandemic? A prospective cohort study in Japan. *Eur Geriatr Med*. 2021;12:1085–9. <https://doi.org/10.1007/S41999-021-00523-2>.
 42. Thomas S, Littleboy K, Foubert J, Nafilyan V, Bannister N, Routen A, et al. Impact of the COVID-19 pandemic on hospital episodes for falls and fractures associated with new-onset disability and frailty in England: a national cohort study. *Age Ageing*. 2024;53. <https://doi.org/10.1093/AGEING/AFAE071>.
 43. McAuley HJC, Evans RA, Bolton CE, Brightling CE, Chalmers JD, Docherty AB, et al. Prevalence of physical frailty, including risk factors, up to 1 year after hospitalisation for COVID-19 in the UK: a multicentre, longitudinal cohort study. *EClinicalMedicine*. 2023;57. <https://doi.org/10.1016/j.eclinm.2023.101896>.
 44. Piotrowicz K, Gąsowski J, Michel JP, Veronese N. Post-COVID-19 acute sarcopenia: physiopathology and management. *Aging Clin Exp Res*. 2021;33:2887–98. <https://doi.org/10.1007/S40520-021-01942-8>.
 45. Huang L, Yao Q, Gu X, Wang Q, Ren L, Wang Y, et al. 1-year outcomes in hospital survivors with COVID-19: a longitudinal cohort study. *Lancet*. 2021;398:747–58. [https://doi.org/10.1016/S0140-6736\(21\)01755-4](https://doi.org/10.1016/S0140-6736(21)01755-4).
 46. Laskou F, Bevilacqua G, Westbury LD, Bloom I, Aggarwal P, Cooper C, et al. A study of diet in older community-dwelling adults in the UK during the COVID-19 pandemic: Findings from the Southampton Longitudinal Study of Ageing (SaLSA). *Front Nutr*. 2023;9. <https://doi.org/10.3389/FNUT.2022.988575>.
 47. Organización Mundial de la Salud. Informe Mundial sobre el envejecimiento y la salud. Ginebra 27, Suiza; 2015.
 48. Akpan A, Roberts C, Bandeen-Roche K, Batty B, Bausewein C, Bell D, et al. Standard set of health outcome measures for older persons. *BMC Geriatr*. 2018;18. <https://doi.org/10.1186/S12877-017-0701-3>.

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