UNIVERSIDADE
BEIRA INTERIOR

Cognitive function of Residential Care Facility residents during COVID-19 pandemic deconfinement

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Dissertação para obtenção do Grau de Mestre em
Medicina
(mestrado integrado)

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março de 2023

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Identificação: BI11051272
Data: 2023-03-16 às 15:12:11

Dedicatória

Ao Mário, que me mostrou que quando a memória se vai ainda sobra a ternura.

Agradecimentos

Ao Lar Major Rato, a todos os seus residentes e à Dra Marta Gonçalves por partilharem connosco os seus pensamentos e sentimentos sobre a sua experiência com a pandemia de COVID-19, e por todo o seu caloroso apoio durante esta investigação.

À Dra. Célia Nunes pela paciência em me explicar os conceitos de bioestatística necessários para o desenvolvimento desta tese.

À Profª Dra. Maria Vaz Pato, pela alegria e brilho nos olhos e pelo exemplo de paixão e profissionalismo pela medicina e pelo ensino.

À Prof. Dra. Rosa Marina Afonso por ser um exemplo de como o profissionalismo pode ser regado com ternura.

Ao Raul e ao Carlos, por desenharem e partilharem este projeto comigo e me inspirarem como colegas.

À Fernandinha por ser uma presença tão firme e alegre ao meu lado e me ouvir sempre de forma tão atenta e dedicada.

Ao Nuno pelo apoio, pelo carinho, pelo companheirismo. Por construir comigo esta versão diferente de sucesso.

Ao Xavier e ao Simão, por toda a paciência e compreensão, por me fazerem perguntas que me fazem olhar para as coisas de sempre de uma forma diferente, pela ternura que me inspiram e me dão.

Resumo

A forma de transmissão do novo coronavírus SARS-CoV-2 fez com que o isolamento social fosse adotado como uma das formas de conter a pandemia. Este isolamento foi imposto de forma mais prolongada e restrita aos utentes de Estruturas Residenciais para Pessoas Idosas (ERPI). O nosso objetivo foi investigar se o desconfinamento do COVID-19 teve, associado a uma suposta redução no isolamento social, um impacto significativo na função cognitiva dos residentes do ERPI. Para esta avaliação aplicámos o Mini-Mental State Examination (MMSE), outras escalas geriátricas e indicadores do envolvimento social desses utentes, procurando a existência de correlações entre estas variáveis. Ao todo, foram avaliados 27 residentes de uma ERPI ao longo de 11 meses de desconfinamento, em três momentos distintos de avaliação (outubro de 2021, março de 2022 e setembro de 2022). Na análise dos dados da primeira avaliação, encontramos uma associação positiva entre o MMSE e a escala de Katz e entre o MMSE e medidas de preensão manual, encontramos também uma associação negativa entre o MMSE e a idade e entre o MMSE e o número de filhos. Verificamos que o MMSE não evoluiu de forma consistente ao longo desses 11 meses, ou seja que o desconfinamento não teve um impacto significativo na função cognitiva. Constatamos que a variação do MMSE entre outubro de 2021 e março de 2022 teve uma correlação positiva e significativa com a idade, o número de filhos e o número de telefonemas semanais da família e amigos. Entre março de 2022 e setembro de 2022 encontramos uma correlação negativa e significativa com a idade. Assim com este trabalho conseguimos identificar alguns fatores que poderão contribuir para a variação da função cognitiva dos residentes da RCF durante o período analisado. A analise destes factores pode ajudar a introduzir mudanças na abordagem cognitiva do idoso institucionalizado.

Palavras-Chave

COVID-19; Desconfinamento; Função cognitiva; idoso; Estruturas residenciais para pessoas idosas; Fatores de risco

Resumo alargado

Introdução

A forma de transmissão do novo coronavírus SARS-CoV-2 fez com que o isolamento social fosse adotado como uma das formas de conter a pandemia, que foi imposta de forma mais prolongada e restrita aos utentes de Estruturas Residenciais para Pessoas Idosas (ERPI).

O nosso objetivo foi investigar se o desconfinamento do COVID-19 teve, associado a uma suposta redução no isolamento social, um impacto significativo na função cognitiva dos residentes do ERPI, usando para tal o Mini-Mental State Examination (MMSE), e se seria possível encontrar alguma correlação com outras escalas geriátricas medidas ou indicadores do envolvimento social desses utentes.

Metodologia

Esta investigação estudou idosos residentes numa Estrutura Residencial para Pessoas Idosas localizada na região da "Beira Interior" de Portugal. Os critérios de inclusão incluíram indivíduos dispostos, colaborantes e capazes de responder aos questionários das escalas geriátricas. Os critérios de exclusão incluíram não ter capacidade mental para concluir os testes da pesquisa, falta de vontade de assinar o termo de consentimento informado, infecção atual por SARS-CoV2 ou isolamento profilático para COVID-19. Do total de residentes (N=110), 27 foram incluídos no estudo.

Foi aplicado um questionário sociodemográfico que pretendeu fazer a caracterização básica da amostra estudada, caracterizando os principais indicadores sociais dos residentes, o número de medicamentos tomados, o tipo de atividades que realizavam antes e depois da COVID-19, a condição médica dos usuários e uma autopercepção do estado de saúde pré-pandêmico e em março de 2022.

O MiniMental State Exame (MMSE (39,40)) foi aplicado em outubro de 2021 (linha de base), março de 2022 e setembro de 2022 para avaliar a função cognitiva e identificar variação com o tempo. Em cada um dos períodos de avaliação avaliamos cada usuário considerando o valor obtido no MMSE e o mínimo necessário para não ser considerado em estado de comprometimento cognitivo. Chamámos a esse valor "distância ao

comprometimento cognitivo". Com os valores obtidos na avaliação do MMSE em outubro de 2021, março de 2022 e setembro de 2022, calculamos a variação do MMSE, considerada como a diferença numérica entre os valores do MMSE obtidos em dois momentos separados de avaliação.

O resto das escalas (escala de Katz (41),HangGrip (42), Escala de triagem de depressão geriátrica Yesavage, Escala de solidão da UCLA versão 3, Inventário de Ansiedade Geriátrica (GAI), Escala de deterioração global) só foram aplicadas em outubro de 2021.

As escalas geriátricas foram aplicadas na forma de questionário oral, incluindo, sempre que necessário, alguns testes motores como o desenho (MMSE) e a preensão manual.

Os participantes foram divididos em grupos "A" e "B" de acordo com o quarteirão da RCF em que residiam, sendo posteriormente atribuído um número aleatório (por exemplo, B13). Todos os dados foram registrados em Google Forms e posteriormente convertidos para Excel. Os dados coletados foram anonimizados (apenas um investigador teve acesso ao nome dos pacientes, que sempre foram identificados por números).

Os dados foram avaliados quanto à normalidade por meio do Statistical Package for the Social Sciences (SPSS) for Windows, versão 28. A correlação foi avaliada pelo coeficiente de Pearson quando verificada a normalidade, caso contrário, foi utilizado o coeficiente Rho de Spearmen. Para verificar a evolução ao longo do tempo da variável MMSE, foi utilizada ANOVA de medidas repetidas, uma vez verificada a normalidade. A normalidade foi avaliada com o teste de Shapiro Wilk.

Resultados

A amostra era composta por 27 moradores, maioria mulheres (74,1%), viúvos há mais de 5 anos (51,9%), com média de 85 anos (DP 8,90), 1,9 filhos (DP 1,00) e 4 anos de escolaridade (DP 3,95). Em média, os residentes receberam 2,4 visitas mensais (DP 1,87) e 18 ligações telefónicas mensais (DP 1,87). Há uma percepção por parte dos moradores de que o número de atividades que realizavam antes da pandemia era maior do que o número de atividades que possuem na altura do questionário. Cerca de dois terços dos moradores apresentavam problemas de visão que não interferiam nas atividades de vida diária, 44% apresentavam problemas auditivos sem uso de aparelho, 40% conviviam com dor diária leve a moderada e a grande maioria nunca bebeu ou

fumou. O número médio de medicamentos tomados diariamente é de 9,5 (DP 4,00). A maioria revelou que considerava o seu estado de saúde regular a bom (92,5%).

Na primeira visita em outubro de 2021 aplicamos todas as escalas geriátricas mencionadas anteriormente. Em média, os residentes apresentam déficit cognitivo leve de acordo com o MMSE (22,81, DP 5,23), comprometimento moderado de acordo com a escala de Katz (4,79, DP1,53), um aperto de mão de 18,1 (DP 8,20), uma pontuação de 9,2 na escala UCLA Loneliness versão 3 (DP 4,00), uma classificação de 3 (ansiedade leve) no Inventário de Ansiedade Geriátrica (GAI) (DP 1,64), e 5,85 pontos (não deprimido) na escala de depressão geriátrica de Yesavage (DP 3,68).

Utilizando os resultados do MMSE e comparando-os com o nível de escolaridade, verificamos que cerca de 30% do grupo apresenta déficit cognitivo. Quando comparamos o grupo com comprometimento cognitivo com o grupo sem comprometimento cognitivo, vemos que o grupo com comprometimento cognitivo possui maior percentagem de mulheres (88% versus 68%), maior média de idade (88 anos vs 83 anos), maior número de filhos (2,13 vs 1,84) e maior percentagem de viúvos recentes (37,5% vs 21,1%).

Em outubro de 2021 encontramos correlações negativas e significativas entre o MMSE e a idade (p-value 0,037) e o número de filhos (p-value <0,001), e correlações positivas e significativas entre o MMSE e a escala de Katz (p-value 0,046) e a preensão manual (p-value 0,049). Segundo Hopkins (49) estas correlações entre idade, escala de Katz e valores de preensão palmar e MMSE são consideradas moderadas e a correlação entre número de filhos e valores do MMSE no mês de outubro é considerada elevada.

Não encontramos variação significativa e consistente do MMSE ao longo dos 11 meses de outubro de 2021 a setembro de 2022 (p-value 0,672).

Com os valores obtidos na avaliação do MMSE em outubro de 2021, março de 2022 e setembro de 2022 foi calculada a variação do MMSE, considerada como a diferença numérica entre os valores do MMSE obtidos em dois momentos distintos de avaliação.

A variação entre os períodos teve um mínimo de -5 (perda de 5 pontos do MMSE entre dois períodos) e 5 pontos, com média de -0,3 no período de outubro a março (DP 2,03) e de +0,4 entre março e outubro (DP 2,36).

Constatamos que a variação do MMSE entre outubro de 2021 e março de 2022 teve correlação positiva com idade (p-value 0,030), filhos (p-value 0,041) e número de

ligações semanais (p-value 0,048). As correlações entre Idade, filhos e número de ligações semanais e variação do MMSE entre outubro e março são consideradas moderadas segundo Hopkins (49).

Também encontramos uma correlação negativa entre a variação do MMSE entre março de 2022 e setembro de 2022 e a idade (p-value 0,022). A associação entre idade e variação do MMSE entre março de 2022 e setembro de 2022 é considerada moderada segundo Hopkins (49).

Discussão/Conclusões

Acreditamos que este estudo trouxe uma contribuição importante para a identificação de fatores protetores e deletérios na função cognitiva de residentes de ERPI.

Um acompanhamento de 11 meses não permitiu encontrar uma evolução consistente da função cognitiva com o desconfinamento. Pensamos que tal se deve ao facto de o desconfinamento poder ter sido recebido com mais ou menos optimismo pelos residentes da RCF, uma vez que as suas rotinas podem ter sido residualmente alteradas. Adicionalmente por não termos o valor de MMSE antes da pandemia é dificil avaliar o impacto real do confinamento e, consequentemente, do desconfinamento.

Este estudo possibilitou identificar fatores protetores e deletérios para a função cognitivo, que podem ter maior ou menor impacto, considerando o contexto em que estão inseridos. Constatámos que é especialmente importante promover a autonomia e o contacto social dos residentes da RCF. Os resultados sugerem ainda que a existência de laços sociais com o mundo exterior, medidos pelo número de chamadas recebidas e pelo número de filhos, teve um impacto positivo e concreto na sua função cognitiva. O que nos lembra que todas as campanhas de publicidade móvel estão corretas: é muito importante telefonar àqueles que amamos.

Palavras-Chave

COVID-19;Desconfinamento;Função cognitiva;idoso;Estruturas residenciais para pessoas idosas;Fatores de risco

Abstract

The form of transmission of the new coronavirus SARS-CoV-2 prompted social isolation to be adopted as one of the ways to contain the pandemic, which was imposed in a more prolonged and restricted way on residents of Residential Care Facilities (RCF). We aimed to investigate if COVID-19 deconfinement had an impact on cognitive function of RCF's residents, evaluated with the Mini-Mental State Examination (MMSE), and if there was any correlation with other measured geriatric scales or indicators of the social engagement of those residents. Altogether, 27 residents from a RCF were evaluated over 11 months during which social isolation measures were eased, at three different assessment moments (October 2021, March 2022 and September 2022). In the analysis of the first assessment data we found that MMSE score had a positive association with Katz score and handgrip measures and a negative association with age and number of children. We found that the MMSE did not evolve consistently over those 11 months. We found that MMSE variation between October 2021 and March 2022 had a positive and significant correlation with age, the number of children and the number of weekly calls. Between March 2022 and September 2022 we found a negative and statistically significant correlation with age. Thus it was possible to identify factors that contributed to the variation of cognitive function of RCF's residents. The analysis of these factors can help introduce changes in the cognitive approach of the institutionalized older adults.

Keywords

COVID-19, deconfinement, Cognitive function, older adult, Residential Care Facilities, risk factors.

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Acronyms list

ERPI	Estrutura Residencial para Pessoas Idosas
DP	Desvio Padrão
MMSE	Mini-Mental State Examination
UBI	Universidade da Beira Interior
RCF	Residential Care Facility
SD	Standard deviation

1. Introduction

The aging of the population and the changes in social structure suggest that the population living in Residential Care Facilities (RCF) might increase in the future.

Institutionalization in RCF's is a consequence of the increase in life expectancy, together with an increase in chronic diseases, associated with daily functional and mental limitations, and reduced levels of autonomy, and the lack of other responses that would allow the older adults to remain at home with support.

Institutionalization rates increase when older people's dependency levels and needs become too complex or expensive to address at home, or through available community services (1). As a result, people living in long-term RCF's often have cognitive impairment and other concomitant comorbidities that will not only increase their morbidity and mortality, but also result in multiple and complex needs in these care settings (1).

Ensuring people's dignity and quality of life in RCF depends, among other things, on promoting, as far as possible, their cognitive functioning and autonomy. Cognitive functioning and autonomy of each of the RCF's residents, is also important as a stimulus and source of wellbeing for other residents.

Recently, the social contact and autonomy of RCFs' residents was reduced by the need for confinement brought about by the COVID 19 pandemic.

The new coronavirus SARS-CoV-2, responsible for the disease COVID-19, was first identified in January 2020 in China, in the city of Wuhan (2).

Most people infected with COVID-19 report mild to moderate respiratory symptoms and recover without requiring intensive care. Older adults or those with other morbidities (cardiovascular disease, diabetes, chronic respiratory disease or cancer) are more vulnerable to this infection (2).

Early on, it was noticed that SARS-CoV-2 caused worse effects in people of older age groups when compared to younger age groups, as was proven in the CDC study (3) in which the probability of needing hospitalization or coming to die is much higher in older adults of different age groups when compared to the age group of 5 to 17 years. In

Europe, according to WHO data (4), although the percentage of new cases in the older adults is around 40%, deaths in the same age group represent around 85% of all deaths.

SARS-CoV-2 is mostly transmitted by aerosols, that is, by coughing or sneezing, and it was necessary to use masks and social isolation as a way of containing the pandemic (2). Thus prophylactic measures were implemented to slow the spread of this pandemic, namely physical distancing, to prevent the disease in age groups at greater risk of severe forms of COVID-19 (5).

In Portugal, COVID 19 had, from March 2020 (date of the first case) to October 2022, five waves: March 2020, November 2020, January 2021, July 2021 and January 2022. There were two general confinements: a first confinement from March to May 2020, and a second confinement from January 2021 to March 2021.

Vaccination started in December 2020, with older adults and RCF's residents, and in October 85% of the population had already taken the first dose of the vaccine. This effort to vaccinate the population was partially offset by the rising of new variants, with different epidemiological characteristics. Nevertheless, since February 2022 there has been a gradual easing of measures to combat the pandemic in Portugal.

RCF have put up a tough fight to control infections and outbreaks during COVID-19 pandemics, trying to protect a particularly vulnerable population. One of the RCF strategies and also one of the measures imposed by many governments, namely the Portuguese one, was the social isolation of RCF's residents.

These physical distancing measures and reduced social contacts have led to increased levels of loneliness, especially among adults and the elderly (6, 7), increasing the risk of poor physical and mental health, cognitive decline, and increased risk of dementia and early mortality (8, 9).

Social isolation and loneliness are distinct concepts and the first does not necessarily imply the second. While loneliness is related to a subjective feeling of discrepancy between the desired and actual quality of social relationships (9), social isolation refers to an objective statute that intends to limit social and physical interactions (10, 11, 12).

Loneliness represents a public health problem, even before the COVID-19 pandemic, as it increases cognitive decline, depressive symptoms and stress, as well as the risk of cardiovascular disease, dementia and early mortality, in addition to reducing the quality of life (13, 14).

During the pandemic, social isolation and unwanted loneliness had a negative impact on several levels, especially on quality of life (15, 16) and potentially on cognitive function.

Muntsant (17) showed a relationship between isolation, hyperactivity, bizarre behaviors and anxiety using studies in mice. Transposing these results to the experience of the pandemic in RCF, the impact of isolation on the mental health considerably increased the burden of caregivers, often also worn out by the stigma that was associated with their profession.

The relationship between confinement and the severity of alterations in neuropsychiatric symptoms of Alzheimer's patients and their caregivers was established by Boutoleau-Bretonnière (18), showing a correlation between the duration of confinement, the severity of symptoms and the caregiver's condition.

Subjective cognitive decline complaints significantly increased during the pandemic in the Portuguese population, more significatively in those with lower pre-pandemic levels of perceived quality of life (19).

The pandemic had a significant impact on RCF's residents, not only because of the disease itself, but also because of the prophylactic measures implemented, namely those related to isolation of the older adults, cancellation or reduction of visits, the impossibility of leaving the RCF except for health issues of proven need, disconnection and lack of contact with families, interruption of clinical follow-up of some conditions/diseases, and the cancellation of many of the existing rehabilitation and occupation activities.

Confinement may also have had an indirect impact on the cognitive function of the home's residents by restricting their movements and autonomy, which relationship with cognitive function is well established (19, 20). Namely the indicators such as gait speed and handgrip strength have a predictive value of the functional capacity and mortality of the elderly (21, 22, 23).

The objective of this study was to evaluate the evolution of the cognitive function of RCF's residents in the center region of Portugal during COVID 19 pandemics, in the period from October 2021 to September 2022, when measures of social isolation were relaxed.

Cognition (the ability to learn, solve problems, remember, and appropriately use stored information) is a key to successful health and aging. A variety of conditions, many age-associated, adversely affect cognition.

Morley (24) found that the individual's protective factors for cognitive function included being younger, working, not belonging to a minority group, being highly educated, having better self-rated health, receiving more emotional support, having better economic satisfaction, and being more religious. Being highly educated and having more social connectedness were protective over time (25).

Environmental factors, such as air pollution, social and built environments, and population composition in living areas, have also been found to be related to cognitive function (26). The protective environmental factor was living in a city with a higher population density (24).

There also are numerous potentially reversible causes of cognitive impairment, which should be addressed to be treated when diagnosed early. These include anticholinergic medications (26, 27), polypharmacy (28), depression (29), metabolic disorders such as hypothyroidism (30), infections, and sleep apnea (31). Defects in vision and hearing can lead to poor performance on cognitive screening and a prolonged sensory isolation can also result in cognitive impairment (32).

Other treatable conditions that when controlled could prevent or slow down ischemic brain damage are hypertension, diabetes, hyperlipidemia, smoking, and atrial fibrillation (33, 34, 35), heart failure and chronic obstructive pulmonary disease (36,37).

There is a consensus that all persons 70 years and older should have their cognitive function (subjectively and objectively) evaluated at least once a year, in order to identify treatable disease, provide lifestyle guidance to try to slow cognitive impairment, to allow recognition of patients who may struggle understanding a physician's instructions, and to allow patients and their families to adequately prepare if they are at risk for developing dementia (24).

Bethell (38) identified strategies might help build and maintain social connections and cognitive function in RCF's residents such as: pain management; sleep at night, not during the day; address vision and hearing loss; find opportunities for creative expression; exercise; maintain religious and cultural practices; garden, either indoors or outdoors; visit with pets; use technology to communicate; laugh together; reminisce

about events, people and places; address communication impairments and communicate non-verbally.

Our work sought to accompany a group of residents in a RCF in central Portugal for 11 months, looking for any relationship between their cognitive function (measured with the Mini Mental State Examination (MMSE) defined by Folstein (39) and validated for Portugal by Guerreiro (40)), social contact indicators ("marital status", "number of visits" and "number of calls received"), medical indicators ("number of drugs", "auditory capacity" and "visual capacity") and other indicators of loneliness, anxiety and functional capacity (correspondent geriatric assessment scales). This evaluation took place over 11 months, from March 2022 to September 2024, during which time the confinement measures varied in terms of intensity for the general population and for the population living in the RCF.

The deconfinement process in the analyzed RCF was not a continuous process but one with several setbacks. Residents did not had visits and where not allowed to leave the RCF between March and December 2020. In January 2021 they were allowed to receive one weekly visit. Those visits were suspended from August 2021 to September 2021 and suspended again from December 2021 to February 2022. Since June 2022 the residents are both allowed to go outside the RCF 2 to 3 times per month and receive weekly visits of two family members or friends.

Our main objective was to analyze if this somehow irregular deconfinement process had an impact in the cognitive function of residents. Additionally, it was intended to identify deleterious or protective factors for the cognitive performance of RCF's residents.

2.Materials and Methods

2.1. Sample selection and study design

This research studied older adults residents of a RCF located in the "Beira Interior" region of Portugal, a region of the Sud of Europe. The first step of recruitment was to establish contact with the RCF's Director to identify possible participants.

Inclusion criteria included willing and collaborative individuals capable of answering the geriatric scales questionnaires. Exclusion criteria included not having the mental ability to complete the research's tests, unwillingness to sign the informed consent form, current infection with SARS-CoV2, or prophylactic isolation for COVID-19. From the total number of residents (N=110), 27 fitted all the previously mentioned criteria, and were therefore included in the study. This signaling was made by the RCF.

2.2. Ethics Statement

The study was approved by the Ethics Committee of UBI – Universidade da Beira Interior, Beira Interior University, Covilhã, Portugal, office number CE-UBI-Pj-2021-044. All participants signed an informed consent form.

2.3. General characterization of participants

We carried out a sociodemographic questionnaire that intended to make the basic characterization of the sample studied, characterizing the main social indicators of the residents (age, gender, marital status, number of children, education, number of monthly visits, number of monthly incoming calls). Also we asked the type of activities they had before and in March 2022.

This questionnaire included questions about the medical condition of users, including vision problems, hearing problems, pain, tobacco and alcohol consumption and a self perception of health status pre-pandemic and in March 2022.

We analyzed the provided medical records and documented the number of drugs prescribed and computed the "number of drugs taken" included regular and SOS medication. This assessment was made in October 2021.

2.4. Geriatric scales

The global geriatric assessment has been defined and applied with the objective of identifying risks and preventing unfavorable outcomes in terms of health (11), which makes it interesting to apply in the COVID-19 deconfinement context, in order to identify potential protective and deleterious factors for institutionalized older adults.

Rubinstein (U12) suggests four main areas of assessment: physical health, which includes clinical assessment; mental health, which includes cognitive and affective assessments; functional capacity, which includes autonomy, independence, exercise capacity, balance and gait; and social assessment, which assesses the family and social support network and habitat.

The geriatric scales were applied in the form of an oral survey, including, whenever necessary, some motor tests such as drawing (MMSE) and the handgrip.

The table below shows the scales applied in the three assessments.

Table 1 - Applied geriatric scales in the three assessments.

October 2021 (baseline)	March 2022	September 2022
Mini Mental State Examination (MMSE) Katz scale Handgrip Yesavage Geriatric depression screening scale UCLA Loneliness scale version 3 Geriatric Anxiety Inventory (GAI) Global deterioration scale	MMSE	MMSE

MMSE (39,40) was applied in October 2021 (baseline), March 2022 and September 2022 in order to assess cognitive function and identify variation with time. MMSE evaluates seven domains: orientation to time, orientation to place, three word registration, attention and calculation, three word recall, language, and visual construction. The higher scores indicate better performances. The score is corrected for education: in people with more than 11 years of schooling, cognitive function is considered affected when the score is ≤27, in a person with 1 to 11 years of schooling, cognition is considered to be affected when ≤22 and in an illiterate person when ≤ 15.

In each of the assessment periods we evaluated each user considering the value obtained in the MMSE score and the minimum necessary to not be considered in a state of cognitive impairment. We called this “distance to cognitive impairment”.

With the MMSE score obtained in October 2021, March 2022 and September 2022 we computed the MMSE variation, considered as the numerical difference between the MMSE scores obtained in two separated assessment moments.

The rest of the scales were only assessed in October 2021.

The Katz Scale (41) is part of the assessment of functional capacity, namely dependence or independence on 6 basic activities: bathing, dressing, using the toilet, transferring (bed/chair), continence and feeding. A score of 6 indicates the patient is independent, 4 indicates the patient has moderate impairment, and 0 indicates the patient is very dependent.

Hand grip strength is an important predictor of functionality, having an important relationship with cognitive function and, together with this, with the autonomous functionality of the subjects (42).

The Geriatric Depression Scale (GDS) by Yesavage (43), in its short version, validated for Portugal (44), allows assessing whether the patient is without depression, mild or moderate depression or severe depression. The higher scores correspond to more depressive symptoms.

The UCLA Loneliness Scale Version 3 (45) consists of a 20-question questionnaire to which the subject can respond from 1 (never) to 4 (often). After completing the questionnaire, we obtained a score, according to which we were be able to determine the subject's subjective loneliness.

The Geriatric Anxiety Inventory (GAI), created by Pachana (46), consists of a questionnaire with 20 questions to which an individual can respond “Agree/Disagree”. After completing the questionnaire, it was be possible to make a subjective determination of the older adults' anxiety. There is also the Portuguese version of the GAI, whose veracity was verified by Ribeiro (47).

The Global Deterioration Scale (GDS) is a tool that provides an overview of the cognitive function of patients with dementia. This assessment allows for a scaling into 7 stages, the first three being characterized by mild deficits and the remaining four

corresponding to dementia stages, with more accentuated cognitive deficits. The fifth stage already corresponds to a state in which the individual can no longer survive without support from others (48).

2.5. Statistical Analysis

Participants were divided into “A” and “B” groups according to the RCF’s block they lived in, and subsequently attributed a random number (e.g., B13).

All data was recorded in Google Forms and subsequently converted to Excel.

The data collected were anonymized (only one researcher had access to the name of the patients, who were always be identified by numbers.

The data was evaluated in terms of normality through the Statistical Package for the Social Sciences (SPSS) for Windows, version 28. Correlation was evaluated using Pearson coeficient when the normality was verified, otherwise Spearmen’s Rho coeficient was used. To verify the evolution over time of the MMSE score, repeated measures ANOVA was used, once normality was verified. Normality was evaluated with the Shapiro Wilk test.

3. Results

3.1. General characterization of participants

The sample consisted of 27 residents, mostly women (74.1%), widowed for more than 5 years (51.9%), with an average of 85 years, 1.9 children, 4 years of schooling. On average, residents received 2.4 visits monthly and 18 monthly phone calls.

Table 2. General data – categorical data.

		Absolute frequency	Relative frequency
Gender	Female	20	74,1%
	Male	7	25,9%
Marital status	Married	5	18,5%
	Divorced	2	7,4%
	Recently widowed	5	18,5%
	Widowed for more than 5 years	14	51,9%
	Single	1	3,7%

	Minimum value	Maximum value	Average	Standard deviation
Age	53	94	84,96	8,90
Children	0	4	1,93	1,00
Education (number of school years)	0	16	4,37	3,95
Monthly visits	0	5	2,41	1,87
Monthly incoming calls	0	120	18,22	23,21

We asked residents the type of activities they had before and after COVID-19. There is a perception on the part of residents that the number of activities they were involved in before the pandemic was higher than the number of activities they currently have.

Table 3. Number of activities before and after COVID-19.

	Before COVID-19	After COVID-19
RCF's residents activities	56%	52%
Religious activitiess	33%	7%
Physical exercise	37%	7%
Manual activities (painting, crochet)	48%	30%
Intellectual stimulation (games)	33%	30%
Other social activities	37%	19%

3.2. Health data

About two-thirds of the residents had vision problems that did not interfere with activities of daily living, 44% had poor hearing without using a device, 40% lived with mild to moderate daily pain, and the vast majority have never drank or smoked.

Table 4. Health data.

		Absolute frequency	Relative frequency
Vision	Normal	3	11,1%
	Disabled- Without interfering with activities of daily living	18	66,7%
	Disabled- Interfering with activities of daily living	6	22,2%
Hearing	Normal	11	40,7%
	Disabled without device	12	44,4%
	Disabled with functional appliance	4	14,8%
Pain	None	8	29,6%
	Some, but not daily	7	25,9%
	Daily, light to average	11	40,7%
	Daily, severe	1	3,7%
Tobacco	Never	22	81,5%
	Occasional	0	0,0%
	Former smoker	4	14,8%
	Current smoker	1	3,7%
Alcohol	Never	19	70,4%
	Former consumer	5	18,5%
	Moderate consumer	3	10,7%

The average number of daily drugs taken is 9.5. As the administration of drugs depended on the nursing team, it is assumed that therapeutic adherence was considerable.

Table 5. Number of drugs taken.

	Minimum value	Maximum value	Average	Standard deviation
Total drugs	4	19	10,30	4,00
Daily drugs	3	19	9,48	4,12
SOS drugs	0	3	0,81	0,92

We asked residents about their perception of their health status pre-pandemic and the majority revealed that they considered their health status to be fair to good, with a reduced number of residents who consider their health to be good to very good.

Table 6. Self-perception of health status.

	Perception of health status pre-pandemic		Perception of health status March 2022	
	Absolute frequency	Relative frequency	Absolute frequency	Relative frequency
Very good	4	14,8%	2	7,4%
Good	14	51,9%	13	48,1%
Reasonable	9	33,3%	12	44,4%
Bad	0	0,0%	0	0,0%

3.3. Geriatric scales assessment in October 2021 (baseline)

In the first visit in October of 2021 we obtained the following results for the geriatric scales.

Table 7. Global deterioration scale applied in October 2021.

		Absolute frequency	Relative frequency
Global deterioration scale	1	15	55,6%
	2	8	29,6%
	3	4	14,8%

According to the global deterioration scale 55,6% residents classify 1 in the global deterioration scale (no cognitive decline), 29,3% has very mild cognitive decline and 14,8% have mild cognitive decline.

On average, the residents have mild cognitive deficit according to "MMSE score" (22,81, SD 5,23), moderate impairment according to "Katz score" (4,79, SD 1,53), a "handgrip" of 18,1 (SD 8,20), a score of 9,2 in the "UCLA Loneliness scale version 3" (SD 4,00), a classification of 3 (mild anxiety) in the "Geriatric Anxiety Inventory (GAI)" (DS 1,64), and 5,85 points (not depressed) in the "Yesavage Geriatric depression screening scale" (DP 3,68).

Table 8. Geriatric scales applied in October 2021.

	N	Minimum value	Maximum value	Average	Standard deviation
MMSE score	27	11,00	30,00	22,81	5,23
Katz score	27	1,00	6,00	4,79	1,53
Handgrip	27	8,00	35,30	18,12	8,20
UCLA Lonileness scale version 3	27	6,00	22,00	9,22	4,00
Geriatric Anxiety Inventory (GAI)	27	0,00	5,00	3,00	1,64
Yesavage Geriatric depression screening scale	26	0,00	13,00	5,85	3,68

Using the MMSE scores and comparing them with the level of education, we can divide the group into residents with cognitive impairment and residents without cognitive impairment. About 30% of the group has cognitive impairment according to the "MMSE score". When we compare the group without cognitive impairment with the group with cognitive impairment, we see that the group with cognitive impairment has a higher "percentage of women", a higher average "age", a higher "number of children" and a higher percentage of "recently widowed people", than the group without cognitive impairment.

Table 9. Group with cognitive impairment vs. group without cognitive impairment general characterization (October 2021).

	Nr residents	Relative frequency	Gender		age				Children			
			nr females	%females	Minimum value	Maximum value	Average	Standard deviation	Minimum value	Maximum value	Average	Standard deviation
With cognitive impairment	8	30%	7	88%	79	94	88,00	4,80	0	4	2,13	1,05
Without cognitive impairment	19	70%	13	68%	53	94	83,70	9,65	0	3	1,84	0,93

Table 10. Group with cognitive impairment vs. group without cognitive impairment marital status (October 2021).

	Single		Married		Divorced		Recently widowed		Widowed for more than 5 years	
	Absolute frequency	Relative frequency	Absolute frequency	Relative frequency	Absolute frequency	Relative frequency	Absolute frequency	Relative frequency	Absolute frequency	Relative frequency
With cognitive impairment	0	0,0%	1	12,5%	0	0,0%	3	37,5%	4	50,0%
Without cognitive impairment	1	5,3%	4	21,1%	2	10,5%	2	21,1%	10	52,6%

3.4. Correlations found in October 2021

We applied Spearman Rho test for those numerical variables that did not have a normal variation, and the test of Pearson for those who had a normal distribution.

In October 2021 we found a negative and significant correlation between “age” and “number of children” and the “MMSE score”, and a positive and significant correlation between “Katz score” and “handgrip score” and the “MMSE score”.

According to Hopkins (49) the association between "age”, “Katz score” and “handgrip score” and “MMSE score” in October is considered moderate and the association between “number of children” and “MMSE score” in October is considered large.

Table 11. Correlation with MMSE score in October 2021 – tests for numeric values.

	Correlation test	Correlation Coefficient	p-value
Age	Spearman's Rho	-0,402	0,037
Number of school years		0,341	0,082
Number of children		-0,607	<0,001
Monthly visits		-0,134	0,504
Weekly calls		0,126	0,531
Katz score		0,388	0,046
Handgrip score		0,382	0,049
UCLA lonileness scale		-0,182	0,364
Geriatric Anxiety Inventory (GAI)		0,139	0,489
Total drugs (Daily+SOS)	Pearson correlation	-0,181	0,366
Daily drugs		-0,212	0,289
Yesavage Geriatric depression screening scale		-0,195	0,341

3.5. Analysis of MMSE variation over time

We found no significant and consistent variation of the MMSE score over the 11 months from October 2021 to September 2022 (p-value 0,672).

With the values obtained in MMSE score in October 2021, March 2022 and September 2022 we computed the "MMSE variation", considered as the numerical difference between the MMSE scores obtained in two separated assessment moments.

Table 12. MMSE scores applied in October 2021, March 2022 and September 2022, and MMSE variation.

		Minimum value	Maximum value	Average	Standard deviation
MMSE scores	MMSE1 (Oct2021)	11,00	30,00	22,81	5,23
	MMSE2 (March2022)	10,00	30,00	22,52	5,21
	MMSE3 (September2022)	10,00	30,00	22,89	5,29
MMSE variation between assessment periods	MMSE2-MMSE1 (variation from October 2021 to March 2022)	-5,00	4,00	-0,30	2,03
	MMSE3-MMSE2 (variation from March 2022 to September 2022)	-5,00	5,00	0,37	2,36
	MMSE3-MMSE1 (variation from October 2021 to September 2022)	-5,00	5,00	0,07	2,63

In October, the "MMSE score" fluctuated between a minimum value of 11 and a maximum value of 30, with an average of 23 (SD 5). In March and September, the minimum values dropped to 10, the average (23) and the standard deviation (5) remained constant.

The “MMSE score” between periods had a minimum of -5 (loss of 5 points of MMSE between two periods) and 5 points, with an average of -0.3 in the period between October and March (SD 2,03) and of +0.4 between March and October (SD 2,36).

We found that “MMSE variation” between October 2021 and March 2022 had a positive correlation with “age”, “children” and the “number of weekly calls”.

The correlation between “age”, “children” and “number of weekly calls” and “MMSE variation” between October and March is considered moderate according to Hopkins (49).

We also found that the variation between March 2022 and September 2022 had a negative correlation with “age”. The association between “age” and “MMSE variation” between March 2022 and September 2022 is considered moderate according to Hopkins (49).

Table 13. Correlations with MMSE variation by Spearmen Rho test.

		Age	Number of school years	Number of children	Monthly visits	Weekly calls	Katz score	Handgrip score	UCLA lonilenes s scale	Geriatric Anxiety Inventory
MMSE2-MMSE1 (variation from October 2021 to March 2022)	Correlation	0,419*	0,137	0.,950	0,145	0,383	-0,096	0,124	0,000	-0,015
	p-value	0,030	0,495	0,041	0,469	0,048	0,633	0,537	0,999	0,941
MMSE3-MMSE2 (variation from March 2022 to September 2022)	Correlation	-0,439	-0,107	-0.169	-0.156	-0,030	-0,040	0,010	-0,086	-0,139
	p-value	0,022	0,595	0,400	0,438	0,882	0,842	0,961	0,671	0,490
MMSE3-MMSE1 (variation from October 2021 to September 2022)	Correlation	-0,090	-0,004	0,206	-0,126	0,113	-,0111	0,001	0,005	-0,147
	p-value	0,656	0,985	0,302	0,531	0,573	0,583	0,995	0,979	0,465

Table 14. Correlations with MMSE variation by Pearson test.

		Total drugs (Daily+SOS)	Daily drugs	Yesavage Geriatric depression screening scale
MMSE2-MMSE1 (variation from October 2021 to March 2022)	Pearson correlation	0,092	0,151	0,096
	p-value	0,650	0,453	0,642
MMSE3-MMSE2 (variation from March 2022 to September 2022)	Pearson correlation	0,290	0,243	-0,207
	p-value	0,142	0,223	0,311
MMSE3-MMSE1 (variation from October 2021 to September 2022)	Pearson correlation	0,331	0,334	-0,096
	p-value	0,092	0,089	0,641

In each of the assessment periods we evaluated each user considering the MMSE score and the minimum necessary to not be considered in a state of cognitive impairment. We called this "distance to cognitive impairment".

Table 15. Distance to cognitive impairment in October 2021, March 2022 and September 2022.

		Minimum value	Maximum value	Average	Standard deviation
Distance to cognitive impairment in the three different assessments	Distance to cognitive impairment1 (October 2021)	-11,00	8,00	1,04	5,10
	Distance to cognitive impairment 2 (March 2022)	-12,00	8,00	0,74	5,12
	Distance to cognitive impairment 3 (September 2022)	-12,00	10,00	1,11	5,24

Table 16. Percentage of the studied RCF's residents that had cognitive impairment according to MMSE.

	October2021	March 2022	September2022
Percentage of people with cognitive impairment according to the MMSE classification	30%	22%	37%

In March 2022 there were less RCF's residents with cognitive impairment.

4. Discussion

Our sample of 27 institutionalized older adults consists mostly of women, widowed for more than 5 years, with an average of 85 years, 1.9 children, 4 years of schooling. This reflects the Portuguese geriatric population distribution, with a lower life expectancy for men, and the possibility that widowed old ladies are more prone to find themselves dependent and sometimes institutionalized. According to McCann et al (50), older women have a higher risk of care home admission than men. Carvalho (51) points out also that women chose help from professionals, sheltered homes, or institutionalization more quickly than men. The gendered patterns found are potentially explained by the persistence of more traditional gender roles prevailing in older cohorts (52). This detailed gender analysis highlights how needs differ between older women, men, and their respective caregivers (53).

The average education level was very low, and as Morley (24) pointed out education is a protective factor for cognitive function. This could explain why most of our subjects had some cognitive decline associated. On the other hand, cognitive impairment is the reason for many people to look for shelter on a ERPI in Portugal, so the characteristics of the sample are expected.

Regarding “MMSE score”, we found a positive correlation with “Katz score” and “handgrip score” and a negative correlation with “age” and the “number of children”. The positive correlation between “MMSE score” with “Katz score” e "handgrip score” was in accordance with Vaz-Patto et al (42) and Chou et al (54), meaning that a bigger autonomous functionality of the subjects contributes to the cognitive function and that a preserved cognitive function might contribute to more autonomy of the subjects. The significant correlation that we found between some aspects of physical performance and cognitive scores in RCF’s residents seems important (55, 56, 57, 58), and points out that the activation of motor networks of different types might involve simultaneously the activation of cognitive networks.

The negative correlation between “MMSE score” and “age” is in accordance with the literature, particularly with Crum et al (58), which also identified an inverse relationship between cognitive performance as measured by the “MMSE scores” and

“age”, and Han et al (60) which stated that “age” had significative importance in the incidence of cognitive impairment as well as Morley et al (24).

In our research the greater the “number of children” the higher the cognitive decline found. This might be justified considering that pregnancy renders substantial changes in brain structure, primarily reductions in gray matter volume in regions sub serving social cognition (61) and that both pregnancy and motherhood confers long-lasting changes in a woman's brain (62). Some of this changes are linked to lower sleep quality in pregnancy which is linked to worse cognitive functioning (63). Other authors found a similar pattern, explaining why being a women is a risk factor for dementia. Meena et al (64) point out that biological changes, along with the stress of assuming the new role of mother, make postpartum women vulnerable to cognitive dysfunction and they found that women had significantly more cognitive deficits during the postpartum period than their non-pregnant counterparts. This effect might not totally fade away with time and have a higher impact in the cognitive performance of older women that had more children. We believe that more attention should be paid to the treatment of sleep disorders and cognitive difficulties in pregnancy and motherhood. This result could also be justified by the fact that women of this age in the rural communities have a past of little schooling and a lifestyle overloaded with family responsibilities and without much availability for other sources of cognitive stimulation. Also many of the children of these woman live in a different city or even different country (high emigration in rural areas), which reduces the availability of social support and of cognitive stimulation. Additionally, the institutionalization of an older adult with several children could have a bigger emotional and even cognitive impact than the institutionalization of an older adult with only one kid or none, since this institutionalization might be less expected, more painful and the feeling of loss and abandonment might be bigger. Also, the higher number of children the higher number of possible motives to worry, more so in a pandemic context.

According to the defined tests (ANOVA) applied to the “MMSE score” of October 2021, March 2022 and September 2022, there is no considerable variation over time, meaning, there is no significant and consistent variation of the “MMSE score” with the deconfinement occurred from October 2021 to September 2022. We were expecting otherwise, namely that, by reducing stress and increasing social bonds, the deconfinement would have a clear positive impact in cognitive function, but this did not occurred in a consistent way for the RCF’s residents. This result can be justified by the way the confinement and deconfinement was lived in the RCF, namely by the fact that the confinement in the RCF was not a continuous process but one with several

setbacks, interrupted by the need to impose restrictions considering new COVID 19 waves and outbreaks in the RCF.

Thus there might not have been a significative change in the routines, social contacts and autonomy of the users during the analyzed period. Considering the reduced number of weekly visits and that they were only allowed to go outside the RCF since June 2022, the feeling of deconfinement may not have been intense enough, and routines may have been kept mainly unchanged in the end.

Also this result is dependent in the way each person dealt with the deconfinement. If for some patients it may have been a sign of optimism and openness, others may have dealt with the deconfinement with some suspicion and stress.

We found a positive correlation between "MMSE variation" from October 2021 to March 2022 with "age", "children" and the "number of weekly calls". In that period older adults had an improvement in cognitive function (maybe because the confinement had been more deleterious, the deconfinement had a higher positive effect). Also people with more children had a significant improvement with the deconfinement because they could have experienced more visits. And people that received more weekly calls also had an improvement in cognitive performance, also because as Heidinger et al (13) and Leigh-Hunt et al (14) established, there a link between loneliness and cognitive decline. Weekly calls can make people feel less lonely and thus have a protective effect on cognitive performance.

Between March 2022 to September 2022 a negative correlation with age was found, which meant that this was a period where the other protective factors became less important and age became deleterious, as it usually is in terms of cognitive function (24, 59, 61).

Although Siqueira (21), and Camacho-Conde (22) demonstrated a correlation between depression and cognitive function in institutionalized older adults, using the Cambridge Cognitive Test (CAMCOG) and the Geriatric Depression Scale (GDS), this result was not obtained by us using "MMSE score" and the "Yesavage Geriatric depression screening scale".

This study had important limitations that should be noted: the sample was small (27 people) and the analyzed sample was subject to a previous choice according to the ability to consent and participate in the geriatric assessment scales. In this sense, the selection process itself may have restricted the sample to the most resilient subjects,

who best adapted to the restrictions of the pandemic and, therefore, benefited modestly from the deconfinement.

This sample belong to a single RCF, which means that in different RCF with different routines and dynamics, different results could have been obtained.

The analysis was carried out for a short time, and the level of deconfinement experienced during that time may have been insufficient to produce positive effects on the residents' cognitive function.

Most of the residents have vision and hearing problems which might have affected the results of the cognitive function scales. Only 30% live without any pain, which is also a burden in terms of quality of life and ability to participate and may interfere with cognitive function.

On average the RCF's residents were polimedicated. A deeper analysis of the medication would be useful considering that polypharmacy and anticholinergic medications can have an impact on the cognitive function (25).

The existence of other reversible causes of cognitive decline was not screened.

Although the short version of MMSE is the most frequent test used, due to its simplicity, it is also its simplicity that warrants some degree of caution, because it gives a rough approach to cognitive status.

Nevertheless, and to the best of our knowledge, this is the first study on cognitive function during pandemics performed with a sample of Portuguese RCF's residents during pandemics.

This study provided the assessment of an RCF's population during the pandemics, done in three different moments, and our results might be a good starting point to define protective measures against cognitive decline in stressful times.

The study intended to contribute to the identification of the impact that a greater or lesser level of isolation can have on the cognitive functioning of users of the RCF, and its results point to the importance of promoting social contact, autonomy and muscle strength to combat the cognitive decline of residents of RCF, especially in situations of confinement such as the one experienced due to the COVID-19 pandemic.

We suggest, for future research, the use of larger samples, more inclusive in terms of participants, over a longer period of time. Additionally, the inclusion of non-institutionalized control groups can enrich the analysis of the results obtained.

Vision and hearing problems should be identified and as possible mitigated before the study, poli-pharmacy as well as other reversible causes of cognitive decline should be screened and mitigated. The use of other cognitive function assessment scales can bring complementary results.

The gender questions should be also be considered both in terms of RCF admission and cognitive function, considering that the generation that is now living on RCF was subject to more traditional gender roles.

Both marital status, gender and parenting impacts on cognitive function should also be explicitly address, in order to identify both protective and deleterious factors.

RCF should also be evaluated regarding the strategies in place to help build and maintain social connections between RCF's residents (38) and between RCF's residents and the outside world.

5. Conclusions

We believe that this study made an important contribution to the identification of protective and deleterious factors in the cognitive function of RCF residents.

An 11-month follow-up did not find a consistent evolution of cognitive functioning with the lack of confinement. We think that this is due to the fact that the deconfinement may have been received more or less optimistically by the residents of the RCF, as their routines may have been residually altered.

Our study made it possible to identify protective and deleterious factors for cognitive functioning, which may have a greater or lesser impact, considering the context in which they are inserted. We found that it is especially important to promote the autonomy and social contact of RCF's residents. Results also suggest that the existence of social ties with the outside world, measured by the number of phone calls received and the number of children, had a positive and concrete impact on their cognitive function. Which reminds us that all mobile advertising campaigns are correct: it is really important to call those we love.

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