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The impact of social isolation due to the COVID-19 pandemic on patients with dementia and caregivers

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Abstract

Objective: Social distancing to limit COVID-19 transmission has led to extensive lifestyle changes, including for people with dementia (PWD). The aim of this study, therefore, was to assess the impact of lockdown on the mental health of PWD and their carers. *Methods:* Forty-five carers of PWD completed a telephone interview during the baseline assessment of the SOLITUDE study to gather information on life conditions and changes in symptoms of PWD during lockdown. Associations between changes in symptoms of PWD and carers' concerns and mental health were investigated. *Results:* About 44% of carers experienced anxiety and irritability and reported changes in behavioural and cognitive symptoms in PWD. These changes were associated with worse carers' mental health and concerns about faster disease progression ($\chi^2 = 13.542$, $p < 0.001$). *Conclusion:* COVID-19-related social isolation has had a negative impact on patients' and carers' mental health. Potential long-term neurocognitive consequences require further investigation.

Significant outcomes

- Carers of people with dementia reported difficulties with their own mental health and observed worsening of behavioural and cognitive symptoms in patients during the first months of lockdown in the UK.
- Worsening of behavioural and cognitive symptoms observed in patients was associated with higher frequency of carers' mental health problems and their concerns about faster disease progression.

Limitations

- The small number of participants recruited, especially with rare forms of dementia, limits any generalisation of findings to the whole clinical population of patients with dementia.
- All carer-reported variables analysed in this investigation nested in the SOLITUDE study were collected cross-sectionally at baseline and, therefore, provide limited evidence of the long-term impact of lockdown.

Introduction

The social context in which a person with dementia (PWD) lives has an impact on both clinical and quality-of-life outcomes. Several dimensions of social engagement contribute to cognitive reserve by supporting cognitive performance, even in the presence of neurodegenerative pathology (Stern, 2012). In fact, older adults with a large social network have been found to have reduced risk of dementia (Fratiglioni *et al.*, 2000) and they maintain cognitive performance within the normal range for a longer period of time before showing objective impairment (Wu *et al.*, 2020). A recent meta-analysis concluded that social isolation may significantly increase one's likelihood of developing dementia (Penninkilampi *et al.*, 2018). In support of this clinical evidence, investigations into the neurobiological effects of the social environment have

found that higher levels of serum brain-derived neurotrophic factor play a mediating role between emotional support gained through social engagement and risk of dementia (Salinas *et al.*, 2017). Moreover, patients with Alzheimer's disease (AD) with larger social networks appear to retain better cognitive performance despite high levels of brain amyloid plaques detected at *post-mortem* (Bennett *et al.*, 2006).

The social environment can also offer useful supporting resources to caregivers of PWD. A recent study found that carers of PWD believed that social support from family, friends and neighbours had positively contributed to enhancing their resilience (Donnellan *et al.*, 2017). This effect seems mediated by positive social interactions that result in reduction of burden associated with caregiving (Han *et al.*, 2014). Being connected to a supportive social network may be particularly beneficial for carers by limiting their feelings of loneliness (Beeson, 2003). Furthermore, better mental health in caregivers can also have a positive impact on patients' care and has been shown to predict mortality rates among patients with neurodegenerative diseases leading to dementia (Lwi *et al.*, 2017).

The coronavirus disease 2019 (COVID-19) pandemic dictated abrupt, drastic and long-lasting limitations to social contacts, and these were enforced in many countries as an initial effort to contain viral spreading. In particular, older adults were confined to their homes for extended periods soon after COVID-19 was declared a pandemic as a preventative measure, given early evidence of them being at higher risk of mortality(Wynants *et al.*, 2020). Moreover, all non-emergency hospital and community services were suspended for several months and many have resumed with alternative consultation formats, limiting face-to-face contact only to special circumstances (Liu *et al.*, 2021). Older adults with cognitive impairments have been particularly disadvantaged by this pandemic for several reasons: (1) they often have health conditions that confer vulnerability not only to dementia but also to COVID-19 (Hwang *et al.*, 2020; Korczyn, 2020) and its consequences on the nervous system (Manca *et al.*, 2021a); and (2) they have been unable to access any relational and healthcare support services, leading to worsening of their mental health early on after lockdown enforcement (Giebel *et al.*, 2020; Manca *et al.*, 2020). Similarly, carers of PWD have been unable to access support services, resulting in limited social contact with professionals and peers.

To respond to the above-mentioned concerning changes affecting PWD, the SOcial LImitations Turn Up DEmentia (SOLITUDE) study (Manca *et al.*, 2021b) was designed with the aim of addressing the central knowledge gap (Liu *et al.*, 2021) of the long-term impact of social isolation due to the COVID-19 pandemic on cognitive and mental health of PWD and on their carers' burden in the United Kingdom (UK).

Methods

Clinical sample

Eighty-three participants (38 PWD/carer dyads and 7 carers alone) were recruited for this study between September 2020 and March 2021 from six centres across the UK.

Clinical records were used to identify potential participants meeting the following criteria: (1) a clinical diagnosis of dementia due to a predominantly neurodegenerative aetiology; (2) a Mini-Mental State Examination (MMSE) score ≥18. Exclusion criteria were as follows: major medical diagnoses (other than dementia) of clinical concern with impact on patients' or carers' physical and mental wellbeing; a non-neurodegenerative primary cause of dementia; history of life-long psychiatric conditions; history of significant acute neurological events (e.g. stroke, traumatic brain injury); absence of a reliable carer cohabiting with the patient; major sensory or speech impairment that would prevent a telephone conversation; no telephone service in place; insufficient use/comprehension of English.

Study protocol

All potential participants were contacted by telephone by a clinician to explore their interest in receiving information about the SOLITUDE study. Within one week, all people willing to take part in the study provided their informed consent, which was audio-recorded over the telephone. All study procedures were carried out in compliance with the Declaration of Helsinki. The study received ethical approval from the NHS Health Research Authority, North West – Preston Regional Ethics Committee, reference n. 20/NW/0305 (protocol version 1).

The SOLITUDE study (osf.io/9chet) is a multi-centre observational longitudinal study in which participants undergo a total of three telephone-based assessments: at baseline (within a week from informed consent), at 3 months and at 6 months. A series of tests and questionnaires were completed by the PWD and their carers to assess patients' cognitive performance, mental health and quality of life, and carers' burden (for the full protocol, see Manca *et al.*, 2021b). At baseline, each carer completed also a customised semi-structured interview with questions on daily-life activities carried out during lockdown and health conditions suffered by them and by the PWD (all questions can be viewed in Table 1). This interview was adapted from one used in previous studies (Cagnin *et al.*, 2020; Rainero *et al.*, 2021).

The aim of this study was to report the findings from the two sections of this interview: (1) carers' responses to questions on their own demographic and social characteristics, life conditions during lockdown, support received and mental health; and (2) carers' responses to questions on the PWD and, specifically, about their functional independence before lockdown, changes in existing and/or emergence of new neuropsychiatric symptoms, changes in motor and cognitive abilities and concerns about progression of dementia.

Statistical analyses

Demographic and clinical characteristics, and interview results were summarised to provide an overview of the sample and of the impact of lockdown on participants of the SOLITUDE study.

Subsequently, analyses were carried out to assess the relationship between subjective and objective descriptors that emerged from the interview and symptoms experienced by PWD and carers. First, chi-square and Fisher's exact tests were run to explore the impact of the support received and that of changes in PWD symptoms on carers' mental health, carers' impression of faster disease progression during lockdown, carers' worries about the consequences of lockdown on PWD and changes in their relationship with PWD. Second, we investigated whether a series of objective variables linked to social isolation (i.e. time spent in lockdown, calculated in days from 23rd March 2020 to the date of baseline assessment; living alone/with carer; frequency of socialising before lockdown) significantly predicted changes in PWD's symptoms using logistic regression models and including the following covariates: last MMSE score available before recruitment, time between last

Table 1. Results of the carers' interview on life conditions and changes in patients' symptoms during lockdown

Interview question	Participants (n = 45)
Part A – Carers in lockdown	
1. Carer lives with PWD (Y/N)	39/6
2. Carer used to live with PWD before lockdown (Y/N)	39/6
3. How many other people included in the household (none/1/2/3)	32/8/4/1
4. Carer working during lockdown (Y/N)	13/32
5. Life changed since lockdown (Y/N)	30/15
6. Relationship with PWD changed since lockdown (No/Worse/Better)	30/7/8
7. Carer worried about lockdown consequences on PWD (Y/N)	25/20
8. Carer welcomes guidelines on COVID-19 for PWD (Y/N)	29/16
9. Issues with continuing therapy/care over lockdown (Y/N)	14/31
10. Used emergency services during lockdown (Y/N)	1/44
11. Carer welcomes remote psychological support (Y/N)	28/17
12. Received support/help during lockdown (Y/N):	28/17
- From family (Y/N)	24/21
- From friends/neighbours (Y/N)	16/29
- From city council (Y/N)	2/43
- From volunteers (Y/N)	3/42
13. Distance from closest neighbour (m)	5.80 ± 8.86*
14. Carer felt isolated/abandoned during lockdown (Y/N)	14/31
15. Carer felt overwhelmed/helpless during lockdown (Y/N)	17/28
16. Carer experienced during lockdown:	15/30
- Distress (Y/N)	14/31
- Depression (Y/N)	20/25
- Anxiety (Y/N)	20/25
- Irritability (Y/N)	
Part B – Patients in lockdown	
1. PWD used to go out before lockdown (Y/N):	43/2
- Yes, independently (Y/N)	26/19
- Yes, accompanied by somebody (Y/N)	17/28
2. PWD used to socialise before lockdown (Y/N):	42/3
- Yes, with friends (Y/N)	36/9
- Yes, with family only (Y/N)	28/17
- Frequency of socialisation (times per month)	10.91 ± 9.72*
3. Changes in behaviour of PWD during lockdown (Y/N):	23/22
- Apathy (Y/N)	12/33
- Anxiety (Y/N)	11/34
- Depression (Y/N)	12/33
- Sleep (Y/N)	7/38
- Delusions (Y/N)	0/45
- Hallucinations (Y/N)	1/44
- Irritability (Y/N)	8/37
- Aggression (Y/N)	2/43
- Wandering (Y/N)	2/43
- Agitation (Y/N)	7/38
- Appetite (Y/N)	7/38

(*Continued*)

Table 1. (*Continued*)

Interview question	Participants (n = 45)
4. New behavioural symptoms in PWD during lockdown (Y/N):	12/33
- Apathy (Y/N)	5/40
- Anxiety (Y/N)	3/42
- Depression (Y/N)	2/43
- Sleep (Y/N)	3/42
- Delusions (Y/N)	2/43
- Hallucinations (Y/N)	0/45
- Irritability (Y/N)	4/41
- Aggression (Y/N)	0/45
- Wandering (Y/N)	0/45
- Agitation (Y/N)	3/42
- Appetite (Y/N)	3/42
5. Changes in behaviour required pharmacological therapy (Y/N)	1/44
6. Changes in motor ability of PWD during lockdown (Y/N):	16/29
- PWD walks better than before (Y/N)	1/44
- PWD walks slower than before (Y/N)	13/32
- PWD is not able to stand without help anymore (Y/N)	2/43
- PWD does not get up from bed anymore (Y/N)	0/45
7. Changes in cognitive symptoms of PWD during lockdown (Y/N):	33/12
- PWD is more confused (Y/N)	26/19
- PWD is more forgetful (Y/N)	29/16
- PWD has more word-finding difficulties (Y/N)	22/23
- PWD is more disorientated at home (Y/N)	6/39
- PWD is more disorientated in time (Y/N)	15/30
- PWD has more difficulty in recognising relatives (Y/N)	4/41
- PWD has more difficulties in recognising himself/ herself in the mirror (Y/N)	1/44
8. Carer thinks the disease has progressed more quickly during lockdown (Y/N)	19/26
9. PWD is aware of the current COVID-19 pandemic (Y/N)	41/4

*Mean ± SD.

MMSE assessment and baseline (in days), age and years of educational attainment. We also investigated the impact of these predictors on four primary outcomes (coded as binary variables: changes vs no changes), that is, any changes in behavioural symptoms, emergence of any new behavioural symptoms, any changes in motor abilities and any changes in cognitive symptoms. Exploratory analyses were subsequently carried out for each individual symptom (either existing or new) associated with the four primary outcomes. Bonferroni's correction was applied to the significance p-value = 0.05 to account for multiple comparisons in each set of analysis.

Results

The majority of patients had a clinical working diagnosis of AD (34/45), including one case of early-onset AD, one case of logopenic primary progressive aphasia and two cases of frontal variant AD. Additionally, the sample included five cases with a working diagnosis of dementia due to mixed aetiology, three with dementia with Lewy bodies, two with posterior cortical atrophy and one case of corticobasal degeneration. All participants were of White British ethnic background and native English speakers. Patients were on

average 70.04 ± 9.33 year old and had 12.96 ± 3.01 years of education. Twenty-five out of 45 were women, and the majority were right-handed (42/45). The average pre-recruitment MMSE score of the sample was 23.94 ± 3.37 that had been obtained 202.62 ± 166.69 days before baseline assessment. Patients had spent an average period of 259.62 ± 71.28 days in lockdown, and most of them were married and lived with their spouse (37/45). Most carers were women (27/45) and spouses or partners (38/45) of patients. The carers' group had an average of 69.24 ± 10.23 years of age and 13.67 ± 2.99 years of education.

Carers' life conditions and the perceived impact of lockdown are reported in part A of Table 1. Most PWD lived only with their carer, and, overall, they had been safe during lockdown, with just one couple reporting having accessed emergency services. None of the participants had tested positive for COVID-19 before recruitment. However, the majority of carers were worried about the consequences of the pandemic on PWD and would have welcomed more information and deployment of dedicated remote support. Over 60% of carers received help during lockdown, mostly from other family members.

Most carers (67%) observed no changes in their relationship with the PWD and only 15% reported a worsening. Over 40% also reported experiencing problems with their own mental health as a consequence of social isolation, especially anxiety and irritability.

The interview revealed that the vast majority of the PWD had an active social life before lockdown was enforced in the UK, and all but one were aware of the COVID-19 pandemic (part B of Table 1). Half of the carers reported worsening of previously existing behavioural/neuropsychiatric symptoms in the PWD, especially apathy and mood problems, that were reported for about 25% of PWD.

Onset of novel behavioural symptoms was reported by 25% of the carers. Incidence of individual symptoms was low, but apathy and irritability were the most common symptoms. Only one patient required pharmacological therapy to treat new neuropsychiatric symptoms. A third of the PWD also showed some decline in motor abilities, especially slowing of walking pace. Changes in cognition were very frequent (73% of participants), mainly worsening of general confusion and memory decline in over 50% of PWD.

Moreover, worsening of PWD's behavioural and cognitive symptoms was associated with carers' perception of faster disease progression during lockdown (Table 2). Other associations, such as that between carers' anxiety and help received from family members, did not survive correction for multiple comparisons.

Exploratory analyses showed several significant associations between changes in specific symptoms of PWD and carers' mental health: (1) worse agitation with carers' distress (Fisher's exact test $p = 0.003$); (2) worse depression (Fisher's exact test $p = 0.004$) and disorientation in time (Fisher's exact test $p = 0.006$) with carers' depression; (3) increased confusion with carers' impression that the disease had progressed more quickly ($\chi^2 = 13.542$, $p = 2.33 \times 10^{-4}$); (4) worse sleep with changes in relationship with PWD ($\chi^2 = 16.724$, $p = 2.34 \times 10^{-4}$), although both worsening and improvements in the relationship with PWD were reported by carers who observed sleep changes.

Logistic regression analyses found no significant association between the three objective predictors (i.e. time spent in lockdown, living alone and frequency of socialising) and changes in patients' symptoms. Associations between age and changes in motor and cognitive abilities did not survive correction for multiple comparisons (Supplementary materials). Similarly, no associations were found with individual symptoms.

Discussion

Our study has identified that carers of PWD, while putting governmental guidelines into practise to maximise their safety, experienced symptoms of anxiety and irritability, possibly due to social isolation during lockdown. Changes in PWD's behavioural and cognitive symptoms were also observed, especially worsening of apathy, mood, confusion and memory problems. Such changes were associated with worsening of carers' mental health and their perception of a faster disease progression in PWD since lockdown enforcement. However, it is possible that these carer-reported changes were of mild severity, especially the appearance of new behavioural symptoms, given that only one patient out of 45 required additional pharmacological treatment. Demographic characteristics, time spent in lockdown and pre-lockdown lifestyle did not predict symptom changes in PWD.

These findings highlight that COVID-19-related social limitations have had an impact on PWD's and carers' mental health in line with observations made in Italy, a country affected by the pandemic in its earlier stage to a similar level as the UK (Rainero et al., 2021). In fact, a qualitative study showed that carers of PWD reported higher stress, loneliness and concerns about care for PWD (Tam *et al.*, 2021). Closures of general practices and hospital services appeared to have added to the sense of responsibility of carers (Tam *et al.*, 2021). In fact, the relationship between PWD and their carers, who made crucial daily-life adjustments to limit COVD-19-related risks, emerged as a pivotal factor contributing to patients' wellbeing during lockdown (Tuijt *et al.*, 2021). Moreover, the stress stemming from unprecedented life changes and from worsening of patients' symptoms exacerbated burden and impacted on mental health of some carers (Cagnin *et al.*, 2020; Pongan et al., 2021).

The SOLITUDE study provides additional evidence on the impact that the UK lockdown has had on PWD and on how worsening of patients' symptoms has added to the burden of their carers. Indeed, it is likely that worsening of patients' behavioural and cognitive symptoms may have had a detrimental impact on their carers' mental health, although the directionality of this relationship was not specifically tested in our analyses and we cannot exclude that carers with a tendency to experience mental health problems were more likely to report changes in patients' symptoms.

Despite the small sample size, these findings are consistent with those observed in other countries and highlight the importance of addressing the consequences of prolonged social isolation on PWD and their carers. The small number of patients with rare forms of dementia prevented any sub-group analyses; however, Zucca et al. (2021) found that carer's burden and distress did not differ depending on the aetiology, but were rather affected by severity of cognitive impairment, a theme that also emerged from our data.

In conclusion, the first lockdown due to the COVID-19 pandemic appears to have had a detrimental impact especially on mental health of PWD and their carers. Although carer-reported data might not be as reliable as those collected by trained clinical researchers due to possible lack of objectivity, this study and previous investigations consistently showed that some subjectively reported symptoms, especially mood alterations, were common during lockdown among both PWD and carers. Future investigations will be needed to assess objectively the potential long-lasting consequences of social isolation on cognitive decline and to provide insights on how to intervene early to mitigate

Table 2. Associations between carer-reported symptoms of PWD during lockdown and carers' mental health and concerns (Chi-square or Fisher's exact test and associated *p*-values)

Carer-reported variables	Help received				Symptoms of PWD			
	Family	Friends	Council	Volunteers	Behaviour change	New behaviours	Movement change	Cognition change
Carers' mental health								
Isolation	2.53 (0.111)	(0.313)*	(0.530)*	(0.541)*	1.41 (0.235)	(0.147)*	(0.090)*	0.04 (0.846)
Helplessness	0.33 (0.565)	1.58 (0.209)	(0.715)*	(0.279)*	4.19 (0.042)†	(0.325)*	0.00 (0.977)	(0.096)*
Distress	0.40 (0.526)	1.21 (0.271)	(1.000)*	(0.540)*	2.18 (0.140)	(0.174)*	0.05 (0.826)	(1.000)*
Depression	0.90 (0.344)	0.00 (0.988)	(1.000)*	(0.541)*	3.36 (0.067)	(0.147)*	(0.738)*	(0.009)*,†
Anxiety	6.79 (0.009)†	0.31 (0.577)	(1.000)*	(0.242)*	0.218 (0.641)	(0.320)*	1.40 (0.236)	5.11 (0.024)†
Irritability	2.57 (0.109)	0.31 (0.577)	(1.000)*	(0.242)*	5.14 (0.023)†	(0.320)*	0.01 (0.944)	2.51 (0.113)
Carers' concerns								
Faster disease progression	0.275 (0.600)	0.62 (0.433)	(0.173)*	(0.577)*	**10.20 (0.001)‡**	1.74 (0.187)	2.00 (0.157)	**11.96 (0.001)‡**
Lockdown consequences on PWD	2.57 (0.109)	1.75 (0.186)	(0.495)*	7.30 (0.026)†	1.78 (0.182)	0.05 (0.821)	0.01 (0.944)	0.21 (0.651)
Changes in relationship with PWD	0.48 (0.787)	3.13 (0.209)	1.85 (0.396)	(0.252)*	5.65 (0.059)	7.84 (0.020)†	0.24 (0.888)	2.23 (0.328)

*Fisher's exact test significance.
† *p* < 0.05, not significant after correction for multiple comparisons.
‡ Significant association after correction for multiple comparisons.

any negative impact. Indeed, evidence from our study, and from similar investigations across the world, should provide insight to policymakers on how to support PWD during this and future pandemics requiring social isolation.

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