Effects of social isolation on the cognitive status of people over 65 years of age during the SARS-CoV-2 pandemic: A longitudinal comparative study

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Abstract

Introduction

The SARS-CoV-2 pandemic has affected the entire population, especially vulnerable people with risk factors, such as people aged over 65 years. Globally and nationally, health protection measures were established to reduce transmission and the impact of the disease on the health-care system, such as using face masks, hand washing, and social distancing, among others. This led to restrictions on activities outside the house, which affected the cognitive sphere of the population, especially people over 65 years of age.

Objective

To demonstrate that social isolation causes changes in the cognitive status of people over 65 years of age.

Methods

A longitudinal study was conducted from 2019 to 2020, with the participation of 37 older adults in a parish club of support activities who voluntarily agreed to participate by signing the informed consent form. The Folstein Mini-Mental State Examination was administered to all of them at two points in the study: before the pandemic and after six months of strict social isolation established as a control measure for the SARS-CoV-2 pandemic. We looked for cognitive status differences during this period and studied qualitative-quantitative sociodemographic variables.

Results

The club members were older people, predominantly women. The mean age of the participants was 75.4 years; 89.2% had primary schooling (less than ten years of formal education). The identified prevalent diseases were arterial hypertension and type-2 diabetes mellitus. In the first evaluation, six out of thirty-seven participants had slight cognitive deficits (16.2%), all females; there were no cases of cognitive impairment; the rest had normal cognitive status (31 out of 37, or 83.8%). After the second evaluation (at the end of strict isolation due to the pandemic), we observed that 11 (29.7%) participants had slight cognitive deficits (ten female and one male), which represents an increase of 13.5%. In addition, four participants (10.8%) showed mild cognitive impairment, all females. Such changes were statistically significant (p-value < 0.05). We conclude that social isolation due to the SARS-CoV-2 pandemic was related to changes in the cognitive status of the elderly.

Main messages

- The COVID-19 pandemic affected various age groups, such as people over 65, with physical and emotional changes.
- As part of a larger previous investigation, this study has the advantage of comparing data related to the cognitive status of older adults before and during the COVID-19 pandemic.
- The small population sample size and the difference between males and females are limitations of this work that hindered the analysis from determining the relationship between gender and cognitive impairment.

Introduction

The emergence of severe acute respiratory syndrome 2 (SARS-CoV-2), also known as coronavirus disease 2019 (COVID-19), at the end of 2019 in Wuhan city, China, quickly spread worldwide, leading to a pandemic in the early 2020 [1–4]. The clinical course involved systemic involvement, causing severe acute respiratory stress syndrome, the leading cause of death in this infection [5–7].

This healthcare crisis affected millions of people around the world. The elderly (definition, as established by the Inter-American Convention on the Protection of the Human Rights of the Elderly, made in Washington on June 15th, 2015, and ratified by Ecuador through Presidential Decree 679 of January 28th, 2019) are included amongst the vulnerable groups. Given the associated risk factors, they are more susceptible to present severe clinical forms of this disease. This situation became more evident during the initial phase of the pandemic, with significant physical, psychological and social impact. All these factors, linked to the lack of protection and late diagnosis of the general population, could be associated with increased death in these individuals [3,8–10].

To prevent infection and the spread of the virus, biosecurity measures such as the use of masks, frequent hand washing, and social isolation (home lockdown) were established in Ecuador and other countries of the world [11–13]. These measures were decreed to reduce morbimortality and avoid the overloading of the national health system; these were especially mandatory for the elderly, who remained at home for six months [14].

In Ecuador, COVID-19 infections spread rapidly, leading to the health emergency declaration by the health authority in March 2020, involving all age groups. Despite restrictive measures, the COVID-19 mortality rose. The mental, emotional, and physical well-being of the elderly was affected during mandatory social isolation [15]. Several authors noted the presence of insecurity, confusion, emotional isolation, acute stress disorder, and impaired cognitive abilities in the elderly [16,17].

Older people often have a decline in multiple organ functions and are more prone to acute illness and hospitalization for chronic decompensated conditions [18]. Studies have reported that being an older person or being worried about the recurrence of COVID-19 constitutes a risk factor for the development of disorders such as anxiety, depression, and dementia in the long term [19]. Likewise, social isolation has been postulated as a predictor of increased morbidity and mortality from cardiovascular disease. Some epidemiological studies have shown that people with poor social support are prone to suffer arterial hypertension, coronary artery disease, or heart failure [20,21].

The focus on prevention, concerning infection and its complications, prioritized the elderly, healthcare personnel, and patients with chronic degenerative and nondegenerative diseases [14,22,23]. Still, difficulties were encountered in the continuity of care.

Cognitive scales allow assessment of the mental status of individuals. In geriatric research and practice, the Mini-Mental State Examination (MMSE) is used, according to *Folstein et al*., which was developed to measure cognitive status, focusing on clinical results quantitatively. It can be used to detect cognitive impairment, estimate severity to a certain point, track the course of cognitive changes in an individual over time, and record personal responses to treatment [24,25].

Methods

Participants

Thirty-seven people over 65 years of age, residents of the Atahualpa parish, Ambato, Ecuador, who are part of the local senior citizens' club, participated in this study. The group was predominantly female. Since this was a small group, no sample was calculated.

Intervention and data collection

A longitudinal study was conducted, which analyzed qualitative and quantitative sociodemographic variables. The information was obtained with a recollection instrument that included age, gender, level of education, and the presence of chronic diseases. The present research arose from the multidisciplinary project "Neural plasticity and mechanisms of adaptation in the elderly to pre-existing pathological neurological conditions", approved in 2018 [26]. In that project, neuroplasticity and adaptive changes made by the elderly were assessed. To assess

cognitive status, the Mini-Mental State Examination was applied in December 2019. This data was the starting point of this research and constituted the initial assessment. The emergence of the pandemic established mandatory social isolation for six months as a preventive measure, where the elderly only interacted with their nuclear family at home. The second evaluation of this research was carried out in the participants' homes, with the strict use of biosecurity equipment, at the end of the state of emergency in September 2020.

Analysis strategy

The information collected, duly coded, was entered into a database created in the SPSS Statistics 25 program, applying Chi-square to establish differences in cognitive status between the two stages of the assessment. Previously, cognitive impairment was defined as any change in the participants that are not in the normal diagnosis. In addition, frequency and correlation tables between qualitative and quantitative data were elaborated with the information collected.

Ethical considerations

Before collecting information, each older adult received a detailed explanation of the research and its objectives. In exercising their autonomy and freedom of decision, the older adults signed the informed consent for their participation. An alphanumeric code was assigned to identify the participant and the corresponding evaluation to protect the information's confidentiality and privacy. The Human Research Ethics Committee (CEISH) SOLCA (CEISHSOLCAQ.OBS.19.10) approved the research project, and the two phases' information was paired.

Results

Within the sociodemographic variables, the age of the 37 elderly participants ranged from 65 to 85 years, with a mean of 75.4 years. According to age groups, 32% of the elderly were between 76 and 80. Women participated in the majority, representing 75.7% of the total, with a 3:1 ratio. 89.2% of the participants reported basic education; no older people with higher education were identified (Table 1).

The most prevalent diseases are arterial hypertension, present in 46% of the elderly people studied, followed by type 2 diabetes mellitus in 16.2%. Hyperthyroidism, joint pain, gastritis, and obesity were also less frequent, as seen in Table 1.

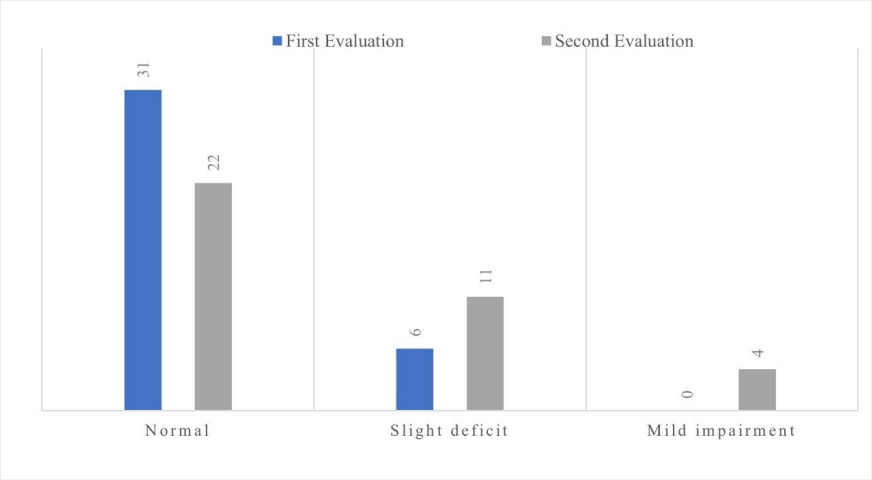
On the other hand, following the purpose of this study, the initial cognitive assessment showed that 83.8% of the elderly

Table 1. Sociodemographic variables, comorbidities, and cognitive assessment.

		Gender		Age ranges				
		Male	**Female**	**65 to 70 years old**	**71 to 75 years old**	**76 to 80 years old**	**81 to 85 years old**	**Total**
Level of education	Basic incomplete	4 (22.2%)	14 (77.8%)	1 (5.6%)	5 (27.8%)	8 (44.4%)	4 (22.2%)	**18 (100%)**
	Basic complete	4 (26.7%)	11 (73.3%)	5 (33.3%)	5 (33.3%)	3 (**20.0%**)	2 (13.4%)	**15 (100%)**
	Secondary school	1 (25.0%)	3 (75.0%)	3 (75.0%)	0	0	1 (25.0%)	**4 (100%)**
	Total	**9 (24.3%)**	**28 (75.7%)**	**9 (24.3%)**	**10 (27.0%)**	**11 (29.7%)**	**7 (19.0%)**	**37 (100%)**
Prevalent diseases	Arterial hypertension	4 (23.5%)	13 (76.5%)	3 (17.6%)	4 (23.5%)	5 (29.4%)	5 (29.4%)	**17 (100%**
	Diabetes mellitus	1 (16.7%)	5 (83.3%)	1 (16.7%)	1 (16.7%)	3 (50.0%)	1 (16.6%)	**6 (100%)**
	Hypothyroidism	0	4 (100%)	2 (50.0%)	0	1 (25.0%)	1 (25.0%)	**4 (100%)**
	Joint pain	2 (40.0%)	3 (60.0%)	1 (20.0%)	2 (40.8%)	2 (40.0%)	0	**5 (100%)**
	Gastritis	2 (50.0%)	2 (50.0%)	2 (50.0%)	2 (50.0%)	0	0	**4 (100%)**
	Obesity	0	1 (100.0%)	0	1 (100.0%)	0	0	**1 (100%)**
	Total	**9 (24.3%)**	**28 (75. 7%)**	**9 (24.3%)**	**10 (27.0%)**	**11 (29.7%)**	**7 (19.0%**	**37 (100%)**
Cognitive status - Assessment 1	Normal	9 (29.0%)	22 (71.0%)	8 (25.8%)	8 (25.8%)	10 (32.3%)	5 (16.1%)	**31 (100%)**
	Mild deficit	0	6 (10.0%)	1 (16.7%)	2 (33.3%)	1 (16.0%)	2 (33.3%)	**6 (100%)**
	Mild impairment	0	0	0	0	0	0	**0**
	Total	**9 (24.3%)**	**28 (75.7%)**	**9 (24.3%)**	**10 (27.0%)**	**11 (29.7%)**	**7 (19.0%)**	**37 (100%)**
Cognitive Status - Assessment 2	Normal	8 (36.4%)	**14 (63.0%)**	7 (31.8%)	5 (22.7%)	**6 (27.3%)**	**4 (18.2%)**	**22 (100%)**
	Mild deficit	1 (9.1%)	10 (90.9%)	2 (18.1%)	4 (36.4%)	**4 (3.4%)**	**1 (9.1%)**	**11 (100%)**
	Mild impairment	0	4 (100%)	0	1 (25.0%)	1 (25.0%)	**2 (50.0%)**	**4 (100%)**
	Total	**9 (24.3%)**	**28 (75.7%)**	**9 (24.3%)**	**10 (27.0%)**	**11 (29.%)**	**7 (19.0%)**	**37 (100%)**

Source: Prepared by the authors based on research data.

Figure 1.



had normal values, while in the second assessment performed during the pandemic, the value decreased to 59.5%. In addition, six out of 37 participants showed slight cognitive deficits (16.2%), all females without cases of cognitive impairment. In the second evaluation, there was an increase in the number of people with slight deficits in 11 elderly people (29.8%, ten female and one male), representing an increase of 13.6% in this condition. In addition, four females showed mild impairment, representing an increase of 400% from the first assessment (Figure 1). The results of the Mini-Mental State Examination before and during the pandemic show that the greatest impairment of cognitive status occurred in females compared to males (Table 1).

When comparing cognitive status with chronic non-transmittable diseases, we observed that 70% of the elderly hypertensives and 50% of the people with type-2 diabetes in our study maintained their cognitive status during the pandemic. However, no statistically significant differences were found (p = 0.189 for hypertension and p = 0.245 for type-2 diabetes mellitus). (Table 2).

The change of category in the Mini-Mental State Examination was considered as cognitive impairment. Table 3 shows the evaluations before and after social isolation. When applying Chi-square, they were statistically significant with a p-value = 0.02031.

DISCUSSION

Mild cognitive impairment is a transitional state between normal cognition and dementia. In the present study, people older than 65 years showed a decrease in different areas of cognitive function assessed by the Mini-Mental State Examination after six months of social isolation (p = 0.02031). Changes in daily living skills are evident in mild cognitive impairment. In addition, a greater degree of functional limitation is associated with rapid cognitive decline and possible progression to dementia [27,28].

Social isolation affects cognitive status; *Chun S et al.* concluded that social deprivation carries a 1.26-fold increased risk of progression to dementia (95% CI 1.15 to 1.37), independent of several risk factors such as loneliness and depression [29]. The relationship between social isolation and cognitive impairment in the elderly has been pointed out by several studies that have proposed loneliness as a predictor and marker of pathological

Table 2. Cognitive assessment, prevalent diseases. Atahualpa. 2020.

	First evaluation				Second evaluation			
Comorbidities	**Normal**	**Mild deficit**	**Mild impairment**	**Total**	**Normal**	**Mild deficit**	**Mild impairment**	**Total**
Arterial hypertension	16 (94.1%)	1 (5.9%)	0	17 (100%)	12 (70.6%)	**4 (23.5%)**	**1 (5.9%)**	17 (100%)
Diabetes mellitus	4 (66.7%)	2 (33.3%)	0	6 (100%)	3 (50%)	**1 (16.7%)**	**2 (33.3%)**	6 (100%)
Hypothyroidism	4 (100%)	0	0	4 (100%)	2 (50%)	2 (50%)	0	4 (100%)
Joint pain	4 (80%)	1 (20%)	0	5 (100%)	2 (40%)	2 (40%)	1 (20%)	5 (100%)
Gastritis	2 (50%)	2 (50%)	0	4 (100%)	2 (50%)	2 (50%)	0	4 (100%)
Obesity	1 (100%)	0	0	1 (100%)	1 (100%)	0	0	1 (100%)

Source: Prepared by the authors based on research data

Table 3. Comparison of cognitive status and Chi-square result.

Presence of CI	YES	NO	Total
	n	n	n
First evaluation	6	31	37
Second evaluation	15	22	37
Total	21	53	74
$X^2 = 5.38544$		p = 0.02031 significant	

CI: cognitive impairment.
Source: Prepared by the authors based on research data.

brain changes, including hormonal, genetic, emotional, and behavioral alterations [30,31].

The age of the elderly with cognitive changes presented in this study (65 to 84 years, with a mean of 74.5 years) coincides with those of the study reported by Chandía and Portillo, whose range varied between 70 and 80 years [18].

Mental and cognitive health deteriorates with aging. It has been shown that mental illnesses are more prevalent after 60 [20]. According to the Chilean National Quality of Life Survey, 35.8% of the elderly reported having problems remembering information. People over 75 years of age, female sex, and with basic education have a greater tendency to present cognitive impairment and Alzheimer's disease [18,22]. Although our study detected greater cognitive impairment in women, further research is needed to address these changes in greater depth in the post-pandemic period. This aims to establish appropriate preventive measures, leading to an aging process with better health and quality of life.

In the present study, the female population represents more than fifty percent of the population studied. This characteristic indicates greater participation by females in social settings; they are more sensitive and prefer greater interpersonal connection than males, as investigated by Ramos-Lira [21,32]. Women have a lower prevalence of physical disorders; however, the risk of cognitive impairment increases after 60 years of age [22]. This is consistent with our study, which shows that cognitive deficits in females increased from 16.2% to 29.8% in the second evaluation.

Schooling is an essential factor in cognitive decline. According to the 2010 survey on Health, Well-being, and Aging in Ecuador, the average level of education of older people at the national level was 5.7 years and 3.4 years in the rural highlands region [33]. According to Chandía, in his study, he established that educational level correlated with cognitive impairment, where lower schooling rates represent a predictor variable in low cognitive performance and low intellectual capacity, which also accentuates with age [18]. *Samper et al.* concluded that individuals with lower schooling rates presented 16.7 times more risk of developing some type of cognitive impairment than people with higher schooling rates [34].

Non-transmittable chronic diseases such as arterial hypertension and diabetes mellitus have been described as risk factors for developing and progressing cognitive impairment due to cardiovascular disease [35–37]. In the present study, insufficient evidence has been established to support the fact that optimal control of hypertension and diabetes mellitus helps to reduce cognitive impairment, possibly associated with the fact that the sample analyzed is small. However, *Reig et al.* concluded that, although the same results did not exist in intervention research, the hypothesis linking the metabolic syndrome to cognitive impairment has been demonstrated in other studies [36,38].

Limitations of this study

The data collected in the two phases of the study were derived from a larger investigation that assessed cognitive status in the pre-pandemic phase. The same data was used to assess cognitive changes associated with isolation established by the SARS-CoV-2 pandemic. The pandemic's unpredictability conditioned the study design and did not allow a broader range of sociodemographic data to be obtained.

The entire volunteer group that attended the study was analyzed. However, the population sample was small, and the difference between males and females made it challenging to explore the relationship between gender and cognitive impairment. For this reason, it will be important to design further research in the future to address the problem in a larger population, with a similar gender distribution to the observed in this population group.

Conclusions

The lockdown established to contain the COVID-19 pandemic limited personal contact and social approach. In this study, the impact of social isolation on cognitive status is evident, especially among females, being statistically significant $p < 0.05$. Older people who in the first evaluation were within normal ranges decreased by 29% in the second evaluation. Additionally, in older persons with mild cognitive deficit, there was an increase of 83.3%, while mild impairment appeared with an increase of 400% from the first evaluation.

The female gender was the most affected by cognitive impairment, although it is true that the sample had a female predominance. Hypertensive and diabetic patients were in the group that went from normal to mild deficit, and those with mild deficit to mild impairment. However, no statistically significant differences were found ($p = 0.189$ for hypertension and $p = 0.245$ for type-2 diabetes mellitus). No relationship was found between a higher level of education and less cognitive impairment, as has been shown by other authors.

Consequently, further research is needed to assess cognitive impairment's influence and possible association with biological, social, and cultural variables. The research addressed these, although such associations were not statistically significant since the sample size was small.

Given the results of this research and the evidence presented, it is necessary to implement programs in the area of mental

health that combine promotional and preventive actions for cognitive impairment with a permanent evaluation that allows their dissemination to similar populations in other sectors.

Special attention should be paid to keeping people at home physically active and maintaining their daily routine (within the possibilities). In addition, it is necessary to ensure social interaction through technology. Implementation of these measures could have potentially reduced negative emotions during the pandemic.

Notes

Contributor roles

EFJ and AZC: conceptualization, validation, formal analysis, research, writing-first draft, revision, and editing. AAS: conceptualization, validation, research, writing the second draft.

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Competing interests

The authors declare no conflict of interest.

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Protocol registry

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Data availability statement

Data release is available upon request.

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Efectos del aislamiento social en el estado cognitivo de personas mayores de 65 años durante la pandemia SARS-CoV-2: estudio comparativo longitudinal

Resumen

Introducción

La pandemia por SARS-CoV-2, ha afectado a toda la población, especialmente a personas vulnerables y con factores de riesgo, como las personas mayores de 65 años. A nivel mundial y nacional se establecieron medidas de protección sanitaria como medio para reducir la transmisión y el impacto de la enfermedad en el sistema de salud como uso de mascarilla, lavado de manos, distanciamiento social, entre otros. Esto generó restricciones en las actividades fuera del hogar, lo que afectó el aspecto cognitivo de la población, especialmente a las personas mayores de 65 años.

Objetivo

Demostrar que el aislamiento social genera cambios en el estado cognitivo de las personas mayores de 65 años.

Metodología

Se realizó un estudio longitudinal en el periodo de 2019 a 2020, con la participación de 37 personas mayores pertenecientes a un club parroquial de actividades de apoyo, quienes aceptaron participar voluntariamente mediante firma del consentimiento informado. A todos se les aplicó el Mini–Mental State Examination de Folstein en dos momentos del estudio: previo a la pandemia y al cabo de seis meses del aislamiento social estricto establecido como medida de control de la pandemia por SARS- CoV-2. En dicho período se buscaron diferencias en el estado cognitivo y también se estudiaron variables sociodemográficas cuali-cuantitativas.

Resultados

Los integrantes del club son personas mayores, predominantemente mujeres. El promedio de edad de los participantes fue de 75,4 años; el 89,2% tenía escolaridad baja (menos de 10 años de educación). Las enfermedades prevalentes identificadas fueron: hipertensión arterial y diabetes mellitus tipo-2. En la primera evaluación se observó que 6 de 37 participantes presentaron ligero déficit cognitivo (16,2%), todas de sexo femenino; no hubo casos con deterioro cognitivo; los demás tuvieron estado cognitivo normal (31 de 37, es decir 83,8%). Tras la segunda evaluación (al finalizar el aislamiento estricto por la pandemia), se observó que 11 (29,7%) personas registraron ligero déficit cognitivo (10 mujeres y 1 hombre), lo que implica un incremento de 13,5%. Además, se identificaron cuatro casos (10,8%) de los participantes que presentaron deterioro cognitivo leve, todas fueron de sexo femenino. Tales cambios fueron estadísticamente significativos (valor $p < 0,05$). Se concluye que el aislamiento por la pandemia de SARS-CoV-2 está relacionado con cambios en el estado cognitivo de las personas mayores.