

Prevalence of Dementia and Associated Factors among Older Adults in Latin America during the COVID-19 Pandemic

Marcio Soto-Añari^a Loida Camargo^{b,c} Miguel Ramos-Henderson^d
Claudia Rivera-Fernández^e Lucía Denegri-Solís^e Ursula Calle^f Nicanor Mori^f
Ninoska Ocampo-Barbá^g Fernanda López^h Maria Portoⁱ Nicole Caldichoury-Obando^j
Carol Saldías^k Pascual Gargiulo^l Cesar Castellanos^m Salomon Shelach-Bellido^a
Norman Lópezⁱ

^aLaboratorio de Neurociencia, Departamento de Psicología, Universidad Católica San Pablo, Arequipa, Peru; ^bEscuela de Medicina, Universidad del Sinú, Cartagena de Indias, Colombia; ^cFundación Centro Colombiano de Epilepsia y Enfermedades Neurológicas Jaime Fandiño Franky (FIRE), Cartagena de Indias, Colombia; ^dCentro de Investigación e Innovación en Gerontología Aplicada (CIGAP), Facultad de Salud, Universidad Santo Tomás, Santiago, Chile; ^eUniversidad Nacional de San Agustín de Arequipa, Arequipa, Peru; ^fClínica Delgado-Auna, Lima, Peru; ^gInstituto de Neurociencias Comportamentales (INCC), Universidad Autónoma Gabriel René Moreno (UAGRM), Santa Cruz de la Sierra, Bolivia; ^hHospital Nacional Dr. Alejandro Posadas, Buenos Aires, Argentina; ⁱUniversidad de La Costa, Barranquilla, Colombia; ^jDepartamento de Ciencias Sociales, Universidad de Los Lagos, Osorno, Chile; ^kFacultad de Ciencias de la Salud, Universidad San Sebastián, Valdivia, Chile; ^lLaboratorio de Neurociencias y Psicología Experimental, CONICET, Facultad de Ciencias Médicas, Universidad Nacional de Cuyo, Mendoza, Argentina; ^mInstituto Dominicano para el estudio de la Salud Integral y la Psicología Aplicada (IDESIP), Santo Domingo, Dominican Republic

Keywords

Dementia · Prevalence · Aging · Ethnicity · COVID-19

Abstract

Background: The COVID-19 pandemic has had a great impact on cognitive health in Latin American older adults, increasing the risk of cognitive impairment and dementia. Our objective was to analyze the prevalence of dementia and the associated factors in Latin American older adults during SARS-CoV-2 pandemic. **Methods:** A multicentric first phase cross-sectional observational study was conducted during the SARS-CoV-2 pandemic. Five thousand two hundred and forty-five Latin American adults over 60 years of age were studied in 10 countries: Argentina, Bolivia, Chile, Colombia,

Ecuador, Guatemala, Mexico, Peru, the Dominican Republic, and Venezuela. We used the telephone version of Montreal Cognitive Assessment, the “Alzheimer Disease 8” scale for functional and cognitive changes, and the abbreviated version of the Yesavage depression scale. We also asked for sociodemographic and lockdown data. All the evaluation was made by telephone. Cross-tabulations and χ^2 tests were used to determine the variability of the prevalence of impairment by sociodemographic characteristics and binary logistic regression to assess the association between dementia and sociodemographic factors. **Results:** We observed that the prevalence of dementia in Latin America is 15.6%, varying depending on the country (Argentina = 7.83 and Bolivia = 28.5%). The variables most associated with dementia were race and age. It does not seem to be associated with the pan-

demic but with social and socio-health factors. **Conclusion:** The prevalence of dementia shows a significant increase in Latin America, attributable to a constellation of ethnic, demographic, and socioeconomic factors.

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Introduction

The coronavirus today has caused >2 million deaths in the world [1]. Some Latin American countries are among those that report the highest number of infections and deaths from the pandemic (Brazil, Argentina, and Peru). The poor implementation of intermediate and intensive care units, the lack of mechanical ventilators and oxygen, and an inefficient vaccine program; dramatically increased the number of deaths in many Latin American countries [2].

This health crisis has severely impacted all age-groups but with much greater force in the elderly [3]. During the restriction measures due to the pandemic, medical and hospital care services were suspended, as well as complementary nonpharmacological, physical, social, and cognitive intervention services. In some countries, there have been implemented telemedicine services, which have helped many older adults in the clinical follow-up [4]. Unfortunately, these services have not been implemented in all countries or have not had homogeneous coverage [5]. Despite this, the first reports showed higher indicators of mood alterations [6, 7], complaints of cognitive decline [8], and increased consultations for neuropsychiatric problems [9, 10].

As we can see, restrictions in their daily activities, together with the indicators of more precarious health [11] and the impact on the well-being because the pandemic, could increase significantly the risk of developing dementia [12]. Previous studies in Latin America have shown ranges of dementia between 1.8% and 11.5% [13, 14]. Recent reviews show that the global prevalence of dementia for the region is 11%, which is higher than that registered in other parts of the world [15]. This prevalence is influenced by an important combination of ethnic, risk factors (e. g., low educational level and age), and socioeconomic factors [16]. At the moment, we do not know the prevalence of dementia during the COVID-19 pandemic in Latin America.

As it may be observed, the risk of dementia could increase significantly in Latin America during the pandemic, associated not only with well-known risk factors but also with emotional and sociodemographic factors. To

date, no studies have been reported showing the prevalence of dementia in the context of a pandemic and the associated sociodemographic factors. Therefore, we have proposed to analyze the prevalence of dementia and the main associated factors in older Latin American adults during the SARS-CoV-2 pandemic.

Materials and Methods

Study Design and Sampling

The study reports the findings of a first phase cross-sectional observational study (screening), carried out during the SARS-CoV-2 pandemic in 5,245 Latin American older adults over 60 years of age in 10 countries: Argentina, Bolivia, Chile, Colombia, Ecuador, Guatemala, Mexico, Peru, the Dominican Republic, and Venezuela. The sampling was nonprobabilistic and was obtained from private and public clinics and associations of older adults. The exclusion criteria were not been testing positive for SARS-CoV-2 infection, prior clinical diagnosis of dementia or mild cognitive impairment, and without clinical diagnosis of depression or anxiety during the lockdown period (shown in Fig. 1).

Procedure

A group of Latin American researchers and clinicians was formed in April 2020. Between April and May, the measures and protocols to be used were designed, prepared, and tested. The protocol included cognitive, functional, and emotional evaluations and was piloted in May 2020 with 680 participants. Minor changes in linguistic and cultural adaptations were made (e.g., “pieza” [room] in Chile). Simultaneously, study directors together with the country coordinators trained the interviewers in the formats and surveys of the protocol, in addition to the use of the platform to complete the data. All the processes were made online, and every interviewer sends their first full protocol and received a personal feedback from country coordinator. All participants completed about 40 min of individual evaluation via telephone. Additionally, we evaluated a family member with functional and cognitive tests. The evaluations were carried between July and October 2020. We used the National Institute of Aging criteria for dementia [17] and were carried out in 2 phases. A first one was of screening, considering the cutoff points of the telephone version of Montreal Cognitive Assessment (T-MoCA) [18], and “Alzheimer Disease 8” (AD8) [19]. A second part consisted of the review and validation of the presumptive diagnosis by neuropsychologists and neurologists.

Instruments

Participants completed sociodemographic, clinical, lifestyle, mood, cognitive, and functional questionnaires, in addition to information associated with the quarantine. For the evaluation of the emotional state, we used the abbreviated version of the Yesavage geriatric depression scale [20], which has shown acceptable indicators of validity for the detection of mood alterations [21]. We used a cutoff level of 2 points to considered indicators of emotional disturbance.

For the cognitive assessment, we elected the T-MoCa, which has shown important indicators of sensitivity and specificity for

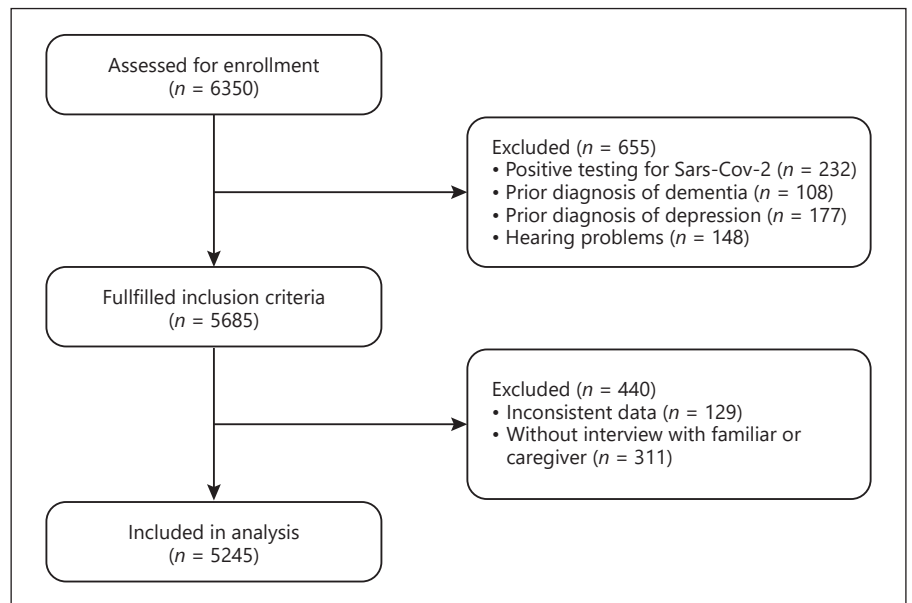


Fig. 1. Flow diagram showing patient involvement.

cognitive alterations [18] and an important concurrent validity with the full version [22]. In Latin America, the MoCa test is the more frequently brief cognitive test used in clinical settings [23]. It contains 5 items that assess memory, fluency, and orientation. The cutoff level of 11 points has been considered.

Additionally, we used the AD8 to evaluate changes in cognitive and functional domains usually altered in dementia syndrome [24]. It has shown a high degree of sensitivity to cognitive impairment when applied to caregiver [19] and adequate when self-completed [25]. The cutoff point of 2 points has been considered [19]. Finally, we used a questionnaire about the quarantine that included items of level of accomplish, days in quarantine, and beginning day of lockdown, which varies according to the country and the propagation of the SARS-CoV-2 virus in the region.

Statistical Analysis

Descriptive statistics were used to indicate the most representative sociodemographic characteristics as well as the scores obtained in the cognitive and functional measurements. We obtained the data of deterioration prevalence considering the cutoff points of the T-MoCa and AD8. Once the prevalence percentages were obtained, cross-tabulations and χ^2 tests were performed to determine the variability of the prevalence of deterioration due to sociodemographic characteristics. Finally, binary logistic regression was applied to evaluate the association between cognitive impairment and sociodemographic factors, adjusted for age, years of schooling, and the Yesavage scale score. The analyses were performed with the SPSS 25 statistical software synchronized with JASP. The significance level used was $p < 0.05$.

Ethical Considerations

All procedures contributing to this work complied with the ethical standards of the relevant National and Institutional Committees on human experimentation and considering the Declaration of Helsinki. All participants or familiar/caregiver were informed of the study and gave their consent online. The research

was approved by the Ethics Committee of the coordinate institution of the project, The Universidad de la Costa (Act no.: 080, research project code: INV.140-02-003-15).

Results

Sociodemographic and Quarantine Characteristics of the Participants

The final sample included 5,245 participants. The age range of the sample was between 60 and 94 years old, with a mean of 69.61 (SD = 7.28). Almost a third of the total sample was women (67%), with the exception of Peru, which exhibits more homogeneous indicators. The highest proportion of race was Latin American mestizo (55.1%), which varies depending on the country (Argentina, 1.2%; Peru, 86.9%), and white (39.4%) with ranges between 8.9% for Peru and 98.8% for Argentina. More than half of the participants are married (52.3%). Likewise, the level of education achieved was mostly high school (38.7%), followed by technical formation (25%). Regarding the pandemic, almost all of the subjects reported having been in quarantine (86.1%) and >70% reported having complied duly with the official confinement measures (see Table 1).

Prevalence of Dementia Globally and by Country

Table 2 shows that the prevalence of dementia for the total sample is 15.6%. We observe that Bolivia and Peru have the highest frequencies of deterioration (28.5% and

Table 1. Descriptive data of total sample

	Frequency (%)/mean \pm SD									
	Argentina	Bolivia	Chile	Colombia	Ecuador	Guatemala	México	Peru	Dominican Republic.	Venezuela
Total										
N	511	565	472	712	436	340	648	601	384	576
Age	70.74 \pm 7.06	68.97 \pm 7.28	69.97 \pm 6.57	69.27 \pm 7.28	69.29 \pm 7.66	69.26 \pm 6.88	70.05 \pm 7.88	70.12 \pm 7.68	69.30 \pm 6.89	68.99 \pm 6.97
Gender										
Male	135 (26.4)	188 (33.3)	156 (33.1)	223 (31.3)	144 (33.0)	98 (28.8)	204 (31.5)	287 (47.8)	142 (37.0)	199 (34.5)
Female	376 (73.6)	377 (66.7)	316 (66.9)	489 (68.7)	292 (67.0)	242 (71.2)	444 (68.5)	314 (52.2)	242 (63.0)	377 (65.5)
Marital status										
Single	39 (7.6)	38 (6.7)	49 (10.4)	107 (15.0)	56 (12.8)	62 (18.2)	74 (11.4)	63 (10.5)	41 (10.9)	86 (14.9)
Married	241 (47.2)	295 (52.2)	238 (50.4)	363 (51.0)	197 (45.2)	165 (48.5)	356 (54.9)	347 (57.7)	219 (57.0)	316 (54.9)
Cohabiting	184 (11.3)	21 (4.1)	17 (3.6)	33 (4.6)	28 (6.4)	13 (3.8)	9 (1.4)	25 (4.2)	17 (4.4)	11 (1.9)
Divorced	595 (21.2)	84 (14.9)	60 (12.7)	82 (11.5)	52 (11.9)	38 (11.2)	60 (9.3)	38 (6.3)	39 (10.2)	71 (12.3)
Widow	1,113 (21.2)	138 (24.4)	108 (22.9)	127 (17.8)	103 (23.6)	62 (18.2)	149 (23.0)	128 (21.3)	67 (17.4)	92 (16.0)
Educational level										
Illiterate/primary school	40 (7.8)	146 (25.8)	54 (11.4)	125 (17.6)	77 (17.7)	49 (14.4)	93 (14.4)	186 (30.9)	88 (22.9)	22 (3.8)
High school	2,101 (40.1)	229 (40.5)	225 (47.7)	302 (42.4)	177 (40.6)	127 (37.4)	215 (33.2)	235 (38.1)	114 (29.7)	222 (38.5)
Technical formation	586 (11.2)	46 (8.1)	65 (13.8)	65 (9.1)	33 (7.6)	32 (9.4)	139 (21.5)	36 (6.0)	35 (9.1)	59 (10.2)
College	1,263 (24.1)	113 (20.0)	104 (22.0)	168 (23.6)	119 (27.3)	106 (31.2)	134 (20.7)	120 (20.0)	112 (29.2)	177 (30.7)
Master/PhD	415 (7.9)	31 (5.5)	24 (5.1)	52 (7.3)	30 (6.9)	26 (7.6)	67 (10.3)	24 (4.0)	35 (9.1)	96 (16.7)
Race										
White	1,985 (37.8)	120 (21.2)	324 (68.6)	227 (31.9)	109 (25.0)	92 (37.1)	229 (35.3)	68 (11.3)	66 (17.2)	295 (51.2)
African American	63 (1.2)	1 (0.2)	0	20 (2.8)	6 (1.04)	6 (1.8)	8 (1.2)	3 (0.5)	3 (0.8)	16 (2.8)
Latin American mestizo	2,957 (56.4)	388 (68.7)	97 (20.6)	426 (59.8)	302 (69.3)	217 (63.8)	406 (62.7)	504 (83.9)	303 (78.9)	259 (45.0)
Latin American indigenous	118 (2.2)	48 (8.5)	23 (4.9)	12 (1.7)	8 (1.8)	2 (0.6)	1 (0.2)	19 (3.2)	1 (0.3)	4 (0.7)
White	122 (2.3)	9 (1.6)	28 (5.9)	27 (3.8)	11 (2.5)	23 (6.8)	4 (0.6)	7 (1.2)	11 (2.9)	2 (0.3)
Lockdown										
No	699 (13.3)	38 (7.4)	140 (29.7)	102 (14.3)	53 (12.2)	69 (20.3)	131 (20.2)	65 (10.8)	47 (12.2)	10 (1.7)
Yes	4,546 (86.7)	473 (83.6)	332 (70.3)	610 (85.7)	283 (67.8)	271 (79.7)	517 (79.8)	536 (89.2)	337 (87.8)	566 (98.3)
Quarantine days	123.15 \pm 42.43	128.59 \pm 40.62	119.62 \pm 58.89	128.57 \pm 45.37	119.66 \pm 34.58	149 \pm 31.880	138.52 \pm 32.12	118.87 \pm 43.75	113.71 \pm 39.66	114.72 \pm 32.84
Quarantine compliance										
Not at all	24 (0.5)	2 (0.4)	1 (0.2)	4 (0.6)	2 (0.5)	19 (5.6)	1 (0.2)	12 (2.0)	2 (0.5)	1 (0.2)
Slightly	102 (1.9)	2 (0.4)	21 (4.4)	14 (2.0)	7 (1.6)	23 (6.8)	8 (1.2)	6 (1.0)	7 (1.8)	27 (4.7)
Somewhat	320 (6.1)	21 (4.1)	41 (8.7)	38 (5.3)	19 (4.4)	91 (26.8)	60 (9.3)	44 (7.3)	18 (4.7)	167 (29.0)
Sufficient	1,476 (28.1)	119 (23.3)	193 (21.4)	193 (27.1)	134 (30.7)	164 (48.2)	104 (31.5)	173 (28.8)	116 (30.2)	372 (64.6)
All the time	2,796 (53.3)	329 (64.4)	187 (39.6)	370 (52.0)	238 (54.6)	297 (87.4)	260 (40.1)	352 (58.6)	204 (53.1)	567 (98.4)
AD8	1.25 \pm 2.01	0.65 \pm 1.56	2.00 \pm 2.28	1.14 \pm 2.10	1.59 \pm 2.12	1.58 \pm 2.32	1.21 \pm 1.93	1.55 \pm 2.22	0.96 \pm 1.75	0.92 \pm 1.58
MoCA	11.84 \pm 2.42	12.42 \pm 2.00	11.73 \pm 2.46	11.60 \pm 2.47	12.04 \pm 2.39	12.08 \pm 2.09	12.30 \pm 2.40	11.24 \pm 2.67	11.61 \pm 2.27	12.26 \pm 2.19
Yesavage	1.09 \pm 1.32	0.779 \pm 1.15	1.35 \pm 1.57	1.06 \pm 1.33	1.09 \pm 1.26	0.91 \pm 1.28	1.27 \pm 1.24	1.39 \pm 1.42	0.86 \pm 1.22	0.78 \pm 1.09

MoCA, Montreal Cognitive Assessment; AD8, Alzheimer disease 8.

Table 2. Prevalence of dementia by country and total

Country	Without dementia, n (%)	With dementia, n (%)
Argentina	471 (92.17)	40 (7.83)
Bolivia	404 (71.50)	161 (28.50)
Chile	396 (83.90)	76 (16.10)
Colombia	620 (87.08)	92 (12.92)
Ecuador	364 (83.49)	72 (16.51)
Guatemala	282 (82.94)	58 (17.06)
Mexico	581 (89.66)	67 (10.34)
Peru	457 (76.04)	144 (23.96)
Dominican Republic	339 (88.28)	45 (11.72)
Venezuela	513 (89.06)	63 (10.94)
Total sample	4,427 (84.40)	818 (15.60)

24%, respectively), while Argentina and Mexico show the lowest (7.83% and 10.34%, respectively).

Prevalence of Dementia by Age, Sex, and Race

We observe that cognitive impairment varies significantly by age and race. Specifically, we see that dementia is higher in older participants, reaching 52.8% among adults between 90 and 94 years old, while in the 60–64 age-groups, it is 9.6%. Likewise, we see that the prevalence of dementia is higher among Latin American Indian people (34.7%) than the other racial groups (see Table 3).

Risk Factors for Dementia

Multivariate analysis reveals that the risk of dementia (odds ratio) in African Americans is 2.2 times higher and in Latin American Indians it is 1.8 times higher than in the other participants. Likewise, we see that at an older age the probability increases significantly. Subjects between 65 and 69 years are 1.3 times more likely to have dementia, while those between 90 and 94 years are 9.5 times more likely. Similarly, we found that the emotional state increases the risk by 1.2 times. The analysis by country shows that there is a higher probability of CI in participants from Bolivia (4 times higher risk), Guatemala (2.9 times higher risk), Peru (2.6 times higher risk), and Ecuador (2.1 times higher risk) to a lesser extent, Chile (1.6) and Venezuela (1.7). Finally, we observed that quarantine did not increase the risk of cognitive impairment in the sample studied (see Table 4).

Discussion

Our purpose was to analyze the prevalence of dementia in Latin America during the SARS-CoV-2-associated pandemic. Our results show a global prevalence of 15.6% of presumptive cases of dementia in older adults without COVID-19 infection, varying according to the country (higher prevalence in Bolivia and Peru and lower in Argentina and Mexico). In addition, we observed an important relationship with age, level of education, ethnicity, and emotional state.

The prevalence found is higher than that reported in other studies [13, 15]. Specifically, Zurique found prevalence with ranges between 2% and 42%, which varied according to the type of study, age of the sample, and diagnostic criteria. Likewise, Nitrini et al. [13] reported a standardized prevalence of 7.1 (ranges between 2.66 and 12.16) but that it increased significantly among illiterates (total prevalence: 15.67, ranges between 5.03 and 36.06). In both cases, a significant variability was observed between countries.

Our data also show important difference between countries. The highest prevalence is found in those countries where social and health systems are the weakest in the region (Bolivia, Peru, and Guatemala) and have indicators of higher health risk such as being overweight or even basic sanitation [26] but also in those that show a higher proportion of the aging population (Chile) [27]. As we can see, Latin America is one of the regions with the highest indicators of inequality in access to health care. Inhabitants with low socioeconomic status, from rural areas and of different ethnic groups, have very limited access to care and indicators of higher health risk [26]. These factors, together with those associated with the pandemic (isolation, greater health neglect), are leading to a major health crisis among older adults, which as we see is exacerbating emotional and cognitive alterations [28].

On the other hand, the data show that the risk of dementia increases significantly with advancing age. We observe that the risk can be 9 times higher among adults aged 90–95 years than between 60 and 64 years. Epidemiological studies have consistently described this pattern [29]. On the other hand, years of schooling have been shown to be a protective factor in different studies [30]. This could be associated with the cognitive reserve effect generated by having higher levels of schooling [31]. However, in Latin American samples, years of schooling seem not to be a good predictor of cognitive performance [32] due to the enormous variability in educational quality in the region.

Table 3. Prevalence of dementia by age, sex, and race

	Without dementia, <i>n</i> (%)	With dementia, <i>n</i> (%)	χ^2
Age-group			
60–64	1,384 (90.39)	147 (9.60)	258.270**
65–69	1,241 (87.58)	176 (12.42)	
70–74	894 (85.55)	151 (14.45)	
75–79	522 (78.38)	144 (21.62)	
80–84	261 (72.50)	99 (27.50)	
85–89	108 (56.84)	82 (43.16)	
90–94	17 (47.22)	19 (52.78)	
Gender			
Male	1,511 (85.08)	265 (14.92)	0.928
Female	2,916 (84.06)	553 (15.94)	
Race			
White	1,720 (86.65)	265 (13.35)	42.240**
African American	52 (82.54)	11 (17.46)	
Latin American mestizo	2,473 (83.63)	484 (16.37)	
Latin American indigenous	77 (65.25)	41 (34.45)	
Another	105 (86.07)	17 (13.93)	

** $p < 0.001$.

Likewise, we observed that ethnicity has a significant relationship with a greater probability of deterioration, especially in African Americans and Latin American Indians. These results have been seen in studies with ethnic minorities [33, 34] and also in population studies in Latin America [35]. These results could be associated with factors linked to the social determinants of health, which combine a series of factors that include a low educational level, greater vascular problems (more cases of diabetes and hypertension), poor eating habits, among others, and that have shown an important effect on health [16]. Finally, we see that the emotional state has a significant impact on the risk of cognitive impairment. As we have seen previously, there is an important effect of the pandemic overemotional state [6] and an altered cognition, as founded in the longitudinal study [36]. It has been considered as a preclinical phase of dementia [37].

It is interesting to note that the factors associated with the pandemic (days of quarantine and the level of accomplish) did not seem to affect the cognitive state of the sample studied. This could be associated with the level of compliance with the government's measures, which in many countries was not total. The need to carry out activities to generate economic income, due to the high degree of informality of the economy [38] and given that the majority of Latin American older adults live with their

family [39], led to maintaining some levels of activity, providing them emotional support during quarantine.

Despite the interesting results found, this study is not exempt of limitations. In first place, considering that it is a cross-sectional study based on the cutoff points of the screening tests and clinical judgment for diagnosis, it is possible to fall in misdiagnosis. However, we have taken the gold standard criteria for dementia diagnosis [17] and follow the guidelines of the handbook for best practices in dementia diagnosis in the Latin America region [40]. Therefore, it is essential to monitor the sample and corroborate the diagnosis. Second, it is important to validate the instruments used. The MoCa test is one of the most widely used instruments in Latin America [23, 41] but its use has been extended to the pencil and paper version. The short version and application via telephone or telemedicine (T-MoCa) have not yet been validated in the region. Despite this, studies in other contexts [42] have shown significant convergent validity of the full version. On the other hand, in the case of AD8, we used the criteria of the Cochrane review [43] and the Chilean version as a reference [19]. Therefore, its validation is necessary in the other countries of the region.

These psychometric aspects of the instruments are fundamental, especially in the current pandemic circumstances where telemedicine and teleneuropsychology have become important for the monitoring and

Table 4. Associated factors to dementia

	Standard error	Odds ratio	<i>p</i> value	95% confidence interval (odds ratio scale)	
Ages of schooling	0.008	0.907	<0.001	0.892	0.923
Yes/average	0.031	1.248	<0.001	1.176	1.328
Race					
Whites (RC)					
African American	0.375	2.143	0.028	1.074	4.708
Latin American mestizo	0.107	0.868	0.184	0.704	1.070
Latin American indigenous	0.242	1.818	0.013	1.131	2.920
Another	0.315	0.757	0.377	0.408	1.405
Age-group					
60–64 (RC)					
65–69	0.131	1.324	0.033	1.023	1.713
70–74	0.138	1.396	0.017	1.061	1.824
75–79	0.143	2.161	<0.001	1.629	2.868
80–84	0.164	3.140	<0.001	2.271	4.342
85–89	0.191	4.944	<0.001	3.385	7.220
90–94	0.378	9.591	<0.001	4.753	20.113
Quarantine compliance					
Not at all (RC)					
Slightly	0.734	2.087	0.316	0.495	8.802
Somewhat	0.685	2.785	0.135	0.727	10.674
Sufficient	0.669	2.834	0.119	0.764	10.509
All the time	0.666	3.027	0.096	0.821	11.157
Gender (female)	0.095	0.840	0.067	0.701	1.016
Country					
Argentina (RC)					
Bolivia	0.216	4.092	<0.001	2.677	6.254
Chile	0.246	1.644	0.044	1.012	2.671
Colombia	0.224	1.470	0.087	0.986	2.376
Ecuador	0.237	2.158	0.001	1.354	3.441
Guatemala	0.244	2.961	<0.001	1.834	4.780
Mexico	0.238	1.181	0.483	0.742	1.882
Peru	0.220	2.618	<0.001	1.696	4.043
Dominican Republic	0.256	1.638	0.081	0.991	2.707
Venezuela	0.228	1.719	0.018	1.099	2.688

RC, reference category.

evaluation of older adults. They could also help generate protocols to serve the rural population and ethnic minorities that do not have access to specialists in cognitive impairment [44]. On the other hand, it is necessary to increase the representativeness of ethnic minorities and rural areas. Our results show a higher prevalence of dementia in ethnic minorities but the sample size is low and the presence of many confounding factors is high. Finally, it would be convenient to analyze the positive cases for COVID and assess the consequences in the medium- and long-term. Recent reviews show neurological alterations [45], so it is important to monitor this population group.

Conclusions

We can conclude that the prevalence of cognitive impairment shows a significant increase in Latin America, which varies depending on the country. The variables most associated with this increased risk are race, gender, and age but it seems not to be associated with the pandemic and if it is associated with social and socio-health factors. This first multicenter study in the context of a pandemic shows the need to follow-up older adults and provide contexts for evaluation, monitoring, and intervention to avoid a significant increase in cases. Furthermore, it highlights the importance of conducting multi-

national studies that allow us to standardize criteria for evaluation, diagnosis, and follow-up.

Statement of Ethics

All procedures followed the ethical standards on human experimentation according to the Declaration of Helsinki. All participants or familiar/caregiver were informed of the study and gave their consent orally. The research was approved by the Ethics Committee of the coordinate institution of the project, the Universidad de la Costa (Act no.: 080, research project code: INV.140-02-003-15).

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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Author Contributions

Marcio Soto-Añari and Norman López made substantial contribution to the conception, design, analysis, and interpretation of data, revised the manuscript for important intellectual content, and approved the final version. Loida Camargo contributed to analysis and interpreted data, revised the manuscript for intellectual content, and approved the final manuscript. Miguel Ramos-Henderson contributed to the design, methods, analysis, and interpretation of data, revised the entire manuscript, and approved the final manuscript. Claudia Rivera-Fernandez and Ninoska Ocampo-Barba contributed to acquisition, analysis, and interpretation of data, revised the manuscript for important intellectual content, and approved the final version. Lucia Denegri-Solís, Ursula Calle, Nicanor Mori, Fernanda López, María Porto, Nicole Caldichoury-Obando, Carol Saldias, and Cesar Castellanos contributed to acquisition, analysis, and interpretation of data, revised the manuscript, and approved the final version. Pascual Gargiulo contributed to analysis and interpretation of data, revised the manuscript for important intellectual content, and approved the final version. Salomon Shelach-Bellido contributed to analysis and interpretation of data, revised the manuscript, and approved the final version.

Data Availability Statement

The data that support the findings of this study can be acquired from the corresponding author upon reasonable request.

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