

Managing noncommunicable diseases during the COVID-19 pandemic in Brazil: findings from the PAMPA cohort

Manejo de doenças crônicas não-transmissíveis durante a pandemia de COVID-19: resultados da coorte PAMPA

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Abstract *The objective was to identify the impact of social distance in the management of noncommunicable diseases (NCD) in the adult population from the state of Rio Grande do Sul, southern Brazil. This is an ambispective, population-based cohort study. Descriptive analysis and Poisson regression models were used and the results were reported as prevalence ratio and 95% confidence intervals. From a total of 1,288 participants, 43.1% needed medical care and 28.5% reported impaired management of NCDs during social distance. Female sex, age between 18 and 30 years old, living in the Serra region (central region of the state), people with depression and multimorbidity were more likely to have impaired management of NCDs. Being physically active reduced the probability of having impaired management of NCD by 15%. Reduced monthly income was associated with the difficulty in accessing prescription medicine and avoidance of seeking in-person medical assistance. Depression was associated with difficulties in accessing medications, while avoidance of seeking in-person medical assistance was more likely for people with multimorbidity, arthritis/arthrosis/fibromyalgia, heart disease, and high cholesterol.*

Key words COVID-19, Chronic diseases, Health Services Accessibility, Epidemiology

Resumo *O objetivo foi identificar o impacto do distanciamento social no manejo das doenças crônicas não transmissíveis (DCNT) na população adulta do estado do Rio Grande do Sul, sul do Brasil. Este é um estudo de coorte ambispectivo de base populacional. Foi utilizada análise descritiva e modelos de regressão de Poisson, os resultados são apresentados em razão de prevalência e intervalos de confiança de 95%. De um total de 1.288 participantes, 43,1% necessitaram de cuidados médicos e 28,5% relataram manejo prejudicado de DCNT durante o distanciamento social. Sexo feminino, idade entre 18 e 30 anos, residente na região da Serra (região central do estado), pessoas com depressão e multimorbidade apresentaram maior chance de manejo prejudicado das DCNT. Ser fisicamente ativo reduziu a probabilidade de ter gerenciamento prejudicado de DCNT em 15%. A redução da renda mensal esteve associada à dificuldade de acesso a medicamentos prescritos e a deixar de buscar atendimento médico presencial. A depressão foi associada a dificuldades de acesso a medicamentos, enquanto deixar de buscar assistência médica pessoalmente foi mais provável para pessoas com multimorbidade, artrite/artrose/fibromialgia, doenças cardíacas e colesterol alto.*

Palavras-chave COVID-19, Doença crônica, Acesso aos Serviços de Saúde, Epidemiologia

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Introduction

Noncommunicable diseases (NCDs) includes long-term conditions such as cardiovascular diseases, cancer, respiratory diseases, and diabetes. NCDs were responsible for 71% of the 57 million deaths that occurred globally and corresponded to 85% of premature deaths (30-69 years) in low- and middle-income countries in 2016¹. Besides the high prevalence, these diseases have remarkable economic burden on health systems^{2,3}.

Alongside with the coronavirus disease pandemic (COVID-19), NCDs require specific care. Indeed, having some NCD increases the risk for serious complications associated with COVID-19⁴. The World Health Organization (WHO) has called for action health agencies to guarantee the maintenance of assistance to people living with NCDs during this pandemic time. In most high-income countries, the COVID-19 preparedness plan included telemedicine to refer patients to specialized health services; while, in upper-middle income countries this strategy was used to refer patients to alternative health services⁵. However, half of the patients with hypertension or diabetes/diabetes-related complications had their treatments partially or completely disrupted during the COVID-19 pandemic.

Notwithstanding the need of the social distancing recommendations to control the COVID-19⁶, these could have an impact on individual health care⁷. People living with NCD need to maintain a routine care, which includes healthy habits, administration of medicines, and regular medical monitoring. Nevertheless, the access and maintenance of healthcare assistance contrast among people from different socioeconomic levels in Brazil, a reality already observed before this pandemic^{3,8}.

Even in strong healthcare systems such as in Germany and the United Kingdom, the spike of COVID-19 cases has induced a chaotic scenario with unavailability of intensive care unit beds, mechanical ventilators, and loss of health professionals due to infections⁹. Consequently, people with NCD had their treatment and access to health services impaired since the beginning of pandemic¹⁰. Therefore, it is urgent to identify the most affected population groups, so health-related decision-making process can be better targeted and then effective. For this reason, this study aimed to identify the impact of social distancing in managing NCDs in an adult population from the Rio Grande do Sul state, the southern Brazilian state.

Methods

The present study analyzed baseline data from the PAMPA Cohort (Prospective Study About Mental and Physical Health), an ambispective cohort with adults living in the Rio Grande do Sul state, southern Brazil. This cohort was approved by the Ethics and Research Committee of the Faculty of Physical Education of the Federal University of Pelotas. This manuscript addresses issues derived from a more comprehensive study, and full description of sample recruitment and methodology can be found elsewhere¹¹. Due to the social distancing, data collection was performed using an online questionnaire via Google® Forms and spread using social networks and contact with health departments using the available communication channels (i.e. e-mail, social media). The recruitment phase lasted from June 22nd to July 23rd, 2020. The complete questionnaire assessed sociodemographic characteristics, low back pain, physical activity, depression, anxiety, and memory before and during social distancing and management of NCD during such period. Questions regarding COVID-19 awareness and knowledge were also included.

Using the prevalence of the three primary outcomes of this cohort (i.e., low back pain, depression and anxiety, and access to healthcare system), the required sample size was 1,764 subjects¹¹. The inclusion criteria were: a) to be 18 years or over, and b) live in the Rio Grande do Sul state. To identify people with NCD, we used the following multiple-choice question: "Has any doctor already told you that you have...?"¹². The options were hypertension, diabetes, cancer, high cholesterol, arthritis/arthrosis/fibromyalgia, asthma/bronchitis, some heart disease, depression, HIV/AIDS, and other. For analyzes purposes, we presented the seven NCDs with the highest prevalence in our sample (depression [32.4%], hypertension [25.2%], high cholesterol [24.2%], asthma/bronchitis [20.6%], arthritis/arthrosis/fibromyalgia [12.3%], diabetes [7.8%], and heart disease [4.4%]). Other chronic conditions did not reach 3% of prevalence. We also assessed the prevalence of multimorbidity, calculated as the proportion of participants with two or more co-existent chronic conditions¹³.

Outcomes

Three outcomes were analyzed in this study: a) Impaired management of NCD, b) Access of medicines, and c) Avoidance to seek health care assistance during the pandemic.

Impaired management of NCD was assessed by the question “How much did social distancing influence the control of your chronic disorder?”. For analyzes purpose the options “Much worse” and “Worsened were merged, the same were made for “Not Change” and “Improved” options.

Access of medicines was evaluated by the question “During social distancing, how would you rate the access to your prescribed medicines?” with the following options: “Easier than before social distancing”, “Same as before social distancing”, “More difficult than before social distancing” or “I didn’t have access”. For analyzes purposes, the last two options were grouped and defined as “impaired access to prescribed medicines”.

Avoiding to seek healthcare assistance was assessed using the question “During social distancing, have you avoided seeking in-person medical care for an existing health problem even if required?”, with “Yes” or “No” as possible answers. In case participant answered yes, the reason for avoiding health assistance was asked.

Exposure variables

Sociodemographic variables

Participants were asked about their gender (male, female), age, skin color (white, black, mixed, yellow or indigenous), highest educational achievement (high school or lower, university degree [graduated], and postgraduate [Specialization, Master, PhD]), and marital status (living with a partner [Yes/No]). Additionally, the city where the participant lived was assessed to stratify our sample by regions of Rio Grande do Sul state (Sul, Metropolitana, Norte, Centro-Oeste, Vales, Serra, and Missioneira [in Portuguese]).

Anthropometric and nutritional variables

Body weight and height were self-reported for later determination of the body mass index (BMI). Participants were classified with either normal ($BMI < 25 \text{ kg/m}^2$) or overweight/obese ($BMI \geq 25 \text{ kg/m}^2$)¹⁴.

Physical activity

Physical activity during the social distancing was also determined. First, participants were asked: “During social distancing, did you regularly engage in physical activities?”. If the answer was “Yes”, the number of days and minutes of practice were asked. Physical activity was then calculated multiplying the number of days by the time of practice in each day, and participants

were further classified as physically inactive (i.e., less than 150 minutes per week) or active (i.e., 150 minutes or more per week)¹⁵.

COVID-19 information

We investigated the participants’ self-rated knowledge about the new coronavirus (SARS-CoV-2), with options ranging from poor to very good/excellent. Reduced working hours since social distancing was calculated using the difference of “What was your weekly working hours before social distancing?” and “What was your weekly working hours during social distancing?”. Decreased monthly income since social distancing was assessed by the question “Did social distancing affect your monthly income?”; yes (reduced), no, yes (increased) were the options. Furthermore, daily routine during social distancing was asked by the following question: “How has your daily routine at home been?”. Answering options were: “staying at home all the time”, “go out only for essential things” (e.g. buying food, go out sometimes to shopping and stretching my legs), “go out every day for some activity”, or “go out every day to work or another regular activity”. The two latest alternatives were merged for analyzes purposes.

Statistical analysis

During data analyzes, we used sampling weight due to heightened proportion of respondents from a specific region of the state (Sul [53.7%]). Descriptive analyzes were presented as proportion or mean and 95% confidence interval (CI) as appropriate. Skin colors black, mixed, yellow, and indigenous were clustered due to their low prevalence and named as non-white group. Poisson regression models were used for all three outcomes. For impaired management of chronic disease during the COVID-19 pandemic, analyzes were adjusted for sex, age, skin color, marital status, highest educational achievement, BMI, regular use of prescribed medicine, physical activity status, daily routine during social distancing, changing in working hours, and knowledge about the COVID-19 pandemic. For impaired access to prescribed medicines and avoiding to seek healthcare assistance, analyzes were adjusted for sex, age, skin color, marital status, highest educational achievement, region, daily routine during social distancing, and economic impact of COVID-19 pandemic. The level of significance was 0.05.

Results

A total of 2,321 people participated in the baseline of the PAMPA Cohort. As described in Table 1, participants with any NCD were older (mean age 41.2 [95%CI: 40.2, 42.2] years) and overweight or obese (59.6 [95%CI: 56.2, 62.9]) compared to excluded participants. As expected, included participants were more likely to use medicines regularly (57.9% [95%CI: 54.5%, 61.2%]), and require healthcare assistance during social distancing (43.1% [95%CI: 39.7%, 46.5%]), when compared with participants without NCD, 3.7% (95%CI: 2.4%, 5.6%) and 29.3% (95%CI: 25.8%, 33.0%), respectively. On the other hand, they were more likely to avoiding to seek healthcare assistance during social distancing (42.1% [95%CI: 37.1%, 47.3%]) when compared with people without NCDs (28.1% [95%CI: 21.9%, 35.2%]). Impaired management of NCD during social distancing was reported by 28.5% (95%CI: 25.5%, 31.6%) of our sample.

Table 2 summarizes the characteristics of the included participants. Only respondents with medical diagnosis of any NCD were included in the present study (n=1,288). Most participants were white (91.7% [95%CI: 89.6%, 93.3%]), lived with a partner (63.1% [95%CI: 59.8%,

66.3%]), and were physically inactive during social distancing (76.3% [95%CI: 73.2%, 79.1%]). When analyzed by gender, women reported more cases of reduced working hours since social distancing (45.3% [95%CI: 40.9%, 49.7%]) and depression (34.3% [95%CI: 30.8%, 38.0%]) than men. On the other hand, overweight or obesity (71.9% [95%CI: 64.7%, 78.2%]) and hypertension (35.6% [95%CI: 28.9%, 43.0%]) were higher in men.

Figure 1A illustrated that 43.1% (95%CI: 39.7%; 46.5%) of participants needed some healthcare service during social distancing, with higher proportion among people with depression (58.2% [95%CI: 52.3%, 63.9%]) and multimorbidity (52.3% [95%IC 47.0%, 57.5%]). Figure 1B showed most participants preferred in-person healthcare assistance during social distancing (85% [95%CI: 80.7%, 88.5%]). However, people with asthma/bronchitis (23.4% [95%CI: 12.7%, 39.1%]), high cholesterol (21.7% [95%CI: 12.2%, 35.7%]), and arthritis/arthrosis/fibromyalgia (20.6% [95%CI: 8.6%, 41.7%]) reported seek more for virtual healthcare assistance, compared to participants with other NCDs. The most common reasons for seeking health services were pre-existing health problem (26.9%), other reasons (22.8%), scheduled return (15.3%), vac-

Table 1. Characteristics of participants excluded and included based on diagnostic of noncommunicable diseases. Rio Grande do Sul, Brazil, 2020 (N=2,321).

	Overall (n=2,321)	Noncommunicable disease	
		No (n=1,033)	Yes (n=1,288)
Age (mean, 95%CI)	38.2 (37.5, 38.9)	34.2 (33.3, 35.1)	41.2 (40.2, 42.2)
Skin color, white (% , 95%CI)	76.6 (74.4, 78.7)	89.2 (86.6, 91.4)	91.7 (89.6, 93.3)
Highest educational achievement, high school (% , 95%CI)	90.6 (89.0, 92.0)	36.2 (32.6, 40.0)	31.1 (28.0, 34.4)
Living with partner (% , 95%CI)	33.3 (30.9, 35.8)	59.6 (55.8, 63.3)	63.1 (59.8, 66.3)
Overweight or obese (% , 95%CI)	61.6 (59.1, 64.0)	44.9 (41.1, 48.8)	59.6 (56.2, 62.9)
Physical activity, inactive (% , 95%CI)	53.3 (50.7, 55.8)	72.2 (68.7, 75.5)	76.3 (73.3, 79.1)
Knowledge about COVID-19, very good/excellent (% , 95%CI)	74.5 (72.3, 76.7)	52.0 (48.1, 55.8)	55.1 (51.7, 58.5)
Reduced working hours since social distancing (% , 95%CI)	53.7 (51.2, 56.3)	44.3 (40.0, 48.7)	43.1 (39.2, 47.0)
Decreased monthly income since social distancing (% , 95%CI)	43.6 (40.7, 46.5)	48.9 (45.0, 52.7)	42.5 (39.2, 45.9)
Regular use of prescribed medicine (% , 95%CI)	45.3 (42.7, 47.8)	3.7 (2.4, 5.6)	57.9 (54.5, 61.2)
Access to prescribed medicines during social distancing, impaired (% , 95%CI)	34.5 (32.1, 37.0)	36.4 (18.9, 58.3)	17.9 (14.7, 21.6)
Required healthcare services during social distancing (% , 95%CI)	18.7 (15.5, 22.4)	29.3 (25.8, 33.0)	43.1 (39.7, 46.5)
Avoiding to seek healthcare assistance (% , 95%CI)	37.1 (34.7, 39.4)	28.1 (21.9, 35.2)	42.1 (37.1, 47.3)

95%CI: 95% confidence intervals.

Table 2. Characteristics of participants diagnosed with noncommunicable disease by sex. Rio Grande do Sul, Brazil, 2020 (N=1,288).

	Overall (n=1,288)	Sex	
		Male (n=258)	Female (n=1,030)
Age (mean, 95%CI)	41.5 (40.7, 42.3)	39.5 (37.5, 41.5)	41.6 (40.5, 42.7)
Skin color, white (% , 95%CI)	91.7 (89.6, 93.3)	88.9 (83.1, 92.9)	92.4 (90.2, 94.1)
Highest educational achievement, high school (% , 95%CI)	31.1 (28.0, 34.4)	34.5 (27.8, 42.0)	30.2 (26.8, 33.9)
Living with partner (% , 95%CI)	63.1 (59.8, 66.3)	62.5 (55.0, 69.4)	63.3 (59.2, 66.9)
Overweight or obese (% , 95%CI)	59.6 (56.2, 62.9)	71.9 (64.7, 78.2)	56.4 (52.5, 60.2)
Physical activity, inactive (% , 95%CI)	76.3 (73.2, 79.1)	73.3 (66.1, 79.3)	77.1 (73.7, 80.2)
Knowledge about COVID-19, very good/excellent (% , 95%CI)	55.1 (51.7, 58.5)	58.1 (50.6, 65.2)	54.3 (50.5, 58.1)
Reduced working hours since social distancing (% , 95%CI)	43.1 (39.2, 47.0)	34.3 (26.6, 42.9)	45.3 (40.9, 49.7)
Decreased monthly income since social distancing (% , 95%CI)	42.5 (39.2, 45.9)	41.9 (34.8, 49.4)	42.7 (38.9, 46.5)
Regular use of prescribed medicine (% , 95%CI)	57.9 (54.5, 61.2)	55.7 (48.2, 63.0)	58.4 (54.6, 62.2)
Access to prescribed medicines during social distancing, impaired (% , 95%CI)	17.9 (14.7, 21.6)	19.9 (12.9, 29.5)	17.4 (13.9, 21.5)
Required healthcare services during social distancing (% , 95%CI)	43.1 (39.7, 46.5)	40.2 (33.0, 47.8)	43.8 (40.1, 47.7)
Avoiding to seek healthcare assistance (% , 95%CI)	42.2 (37.1, 47.4)	49.7 (37.8, 61.6)	40.4 (34.9, 46.1)
Depression (% , 95%CI)	32.4 (29.3, 35.7)	25.5 (19.5, 32.6)	34.3 (30.8, 38.0)
Hypertension (% , 95%CI)	25.2 (22.4, 28.3)	35.6 (28.9, 43.0)	22.5 (19.5, 25.8)
High cholesterol (% , 95%CI)	24.2 (21.4, 27.3)	27.3 (21.1, 34.5)	23.4 (20.3, 26.9)
Multimorbidity (% , 95%CI)	23.3 (21.1, 25.4)	19.5 (15.7, 24.1)	24.4 (21.9, 26.9)
Asthma/bronchitis (% , 95%CI)	20.6 (17.9, 23.5)	20.1 (14.9, 26.7)	20.7 (17.7, 24.0)
Diabetes (% , 95%CI)	7.8 (6.2, 9.7)	9.3 (5.9, 14.5)	7.3 (5.7, 9.5)
Heart disease (% , 95%CI)	4.4 (3.2, 6.0)	2.2 (0.9, 5.0)	5.0 (3.5, 7.0)

Values are reported as proportions and 95% confidence intervals.

cination (13.3%), to get medicine (11.0%), and due to flu symptoms or sore throat (5.1%).

Table 3 shows the crude and adjusted analyzes about impaired management of NCD during social distancing. The probability of such event was 49% greater in women than men and 22% higher in adults aged 31-50 than those aged between 18 and 30 years old. Participants who lived in the Serra region had a probability 55% greater than participants from the Sul region to have impaired management of NCD. Also, people with impaired access to prescribed medicine had a probability 99% greater of uncontrolled NCD than those who had access to medicines. Being considered physically active during social distancing reduced in 15% the probability of having impaired management of NCD during the same period when compared to inactive participants.

Table 4 shows the factors associated with impaired access to prescribed medicines during social distancing. Our findings revealed that participants with university degree or post-graduate (specialization, Master, or Ph.D.) were 51% and 54%, respectively less likely to report impaired access to prescribed medicines during social distancing when compared with participants with less schooling. However, respondents with reduced monthly income had a probability 49% higher to impaired access to medicine during the same period.

Avoidance of seeking healthcare assistance during social distancing was reported by 42.1% (95%CI: 37.1%, 47.3%) of our sample, and the main reason for this was the fear of being contaminated by new coronavirus (77.4% [95%CI: 70.2%, 83.3%]). Table 5 shows that participants

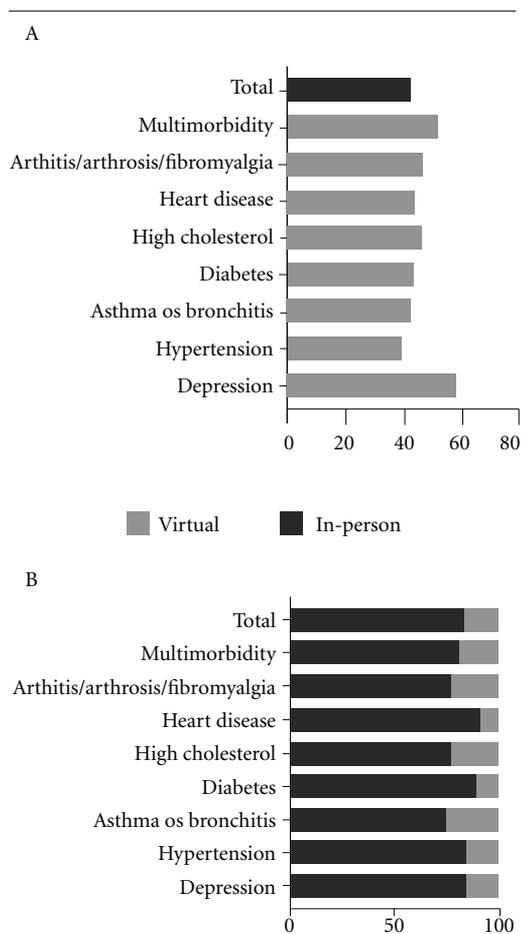


Figure 1. Requirement (A) and type (B) of healthcare assistance used during social distancing by noncommunicable disease among people with NCD. Rio Grande do Sul, Brazil, 2020 (N=1,288).

with specialization, Master, or Ph.D. degree were less likely (38%) to avoid seeking healthcare assistance during social distancing. On the other hand, reduced monthly income during such period increased in 44% the likelihood of avoiding to seek healthcare.

Figure 2 illustrates the prevalence ratio (95%CI) of (A) impaired management of NCD, (B) impaired access to prescribed medicines, and (C) avoid medical assistance. Participants with multimorbidity and depression were more likely to have impaired management of NCD than their counterparts. Also, participants with depression showed higher probability to have impaired access to prescribed medicines during social distancing, while people with multimorbidity, arthritis/arthrosis/fibromyalgia, heart dis-

ease, and high cholesterol had higher probability of avoiding in-person health assistance.

Discussion

This study aimed to verify the impact of social distancing in the health of people with NCD in the southern state of Brazil. Our findings indicate that women, young adults (i.e., 18-30 years), those who lived at the Serra region, had impaired access to prescribed medicines, and had depression and multimorbidity were at higher risk of having impaired management of their NCD. Participants with depression were more likely to have impaired access to prescribed medicine. Further, participants with multimorbidity, arthritis/arthrosis/fibromyalgia, and high cholesterol had higher probability to avoid seeking in-person healthcare services even if required during social distancing.

We revealed that young adults and women were more likely to worsen management of their chronic conditions. Impaired management of NCD in women might be associated with the double workload during social distancing. Besides job-related working hours spent at home, it is known that due to gender inequality in households activities, women are spending more time at home in tasks such as providing care for people with chronic disability and in school-related activities from children¹⁶. This double workload may lead to an overload in physical and mental health, impairing the management of pre-existent conditions during the COVID-19 pandemic¹⁷. Máximo et al.¹⁸ showed that young adults have lower adherence to self-care, indicating that this behavior tends to change with age progression. Consequently, an improved knowledge of how important is to have a better health management is observed as people get old.

The Rio Grande do Sul government developed a controlled social distancing system based on the incidence of COVID-19 cases, hospital beds availability, and number of deaths in each the macroregion¹⁹. Each region within the state was classified into four possible flags (i.e., yellow, orange, red, black [crescent restriction order]) that indicated the stage and necessary approaches to contain the spread of the virus. Regions in the “red flag”, for example, must have their non-essential commercial activities closed, such as shopping malls, stores, restaurants, gyms, and theaters. People living in the Serra region, the central region of the state, were more likely to

Table 3. Crude and adjusted regression analyses between impaired management of noncommunicable diseases during the COVID-19 pandemic and independent variables in adults with diagnosed noncommunicable diseases. Rio Grande do Sul, Brazil, 2020 (N=1,288).

	Crude		Adjusted	
	RP (95%CI)	p-value	RP (95%CI)	p-value
Sex		0.015		0.024
Male	1.00		1.00	
Female	1.52 (1.08, 2.13)		1.49 (1.05, 2.10)	
Age, years		0.039 [#]		0.032 [#]
18-30	1.00		1.00	
31-59	0.78 (0.61, 1.00)		0.78 (0.61, 0.98)	
60+	0.70 (0.46, 1.07)		0.69 (0.45, 1.07)	
Skin color		0.286		0.310
White	1.00		1.00	
Non-white	0.78 (0.49, 1.23)		0.78 (0.49, 1.25)	
Highest educational achievement		0.348 [#]		0.306 [#]
High school or less	1.00		1.00	
University	0.82 (0.60, 1.11)		1.07 (0.44, 2.61)	
Specialization, Master, PhD	0.89 (0.69, 1.16)		0.89 (0.38, 2.08)	
Conjugal status		0.047		0.211
With partner	1.00		1.00	
No partner	1.26 (1.00, 1.59)		1.17 (0.91, 1.49)	
Region		0.014 [#]		0.008 [#]
Sul	1.00		1.00	
Centro-Oeste	0.82 (0.58, 1.16)		0.80 (0.54, 1.18)	
Norte	0.31 (0.11, 0.92)		0.28 (0.07, 1.11)	
Missioneira	0.54 (0.24, 1.20)		0.72 (0.33, 1.59)	
Metropolitana	0.84 (0.69, 1.03)		0.94 (0.76, 1.16)	
Vales	0.78 (0.52, 1.18)		0.59 (0.34, 1.02)	
Serra	1.41 (1.00, 2.00)		1.55 (1.11, 2.15)	
Body mass index		0.317		0.950
Normal	1.00		1.00	
Overweight/obese	0.89 (0.71, 1.12)		0.99 (0.78, 1.26)	
Physical activity		0.126		0.023
Inactive	1.00		1.00	
Active	0.89 (0.77, 1.03)		0.85 (0.74, 0.98)	

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have an impaired NCD management. This region was under the second-highest degree of social distance (“red flag”) during three of the four weeks of recruitment phase of this study. On the other hand, the Sul region (reference group) was at yellow and orange flag during the data collection due to lower number of cases and higher hospital beds availability. Our results suggest that less flexible measures for controlling the coronavirus spread must be followed by strategies to assist people with NCD; otherwise, the country may face an increasingly number of preventable hospitalizations and deaths related to chronic

health condition. However, the impaired management of NCDs in this region may be associated with other factors such as infrastructure and access to health services specific to Serra region during COVID-19 pandemic.

Physical activity has been recommended to prevent and treat NCDs, thus such behavior is essential for a better clinical control of health conditions^{20,21}. We observed that those who were physically active during social distancing had better management of their NCDs. This result reinforces the importance of physical activity promotion to reduce the physical and mental

Table 3. Crude and adjusted regression analyses between impaired management of noncommunicable diseases during the COVID-19 pandemic and independent variables in adults with diagnosed noncommunicable diseases. Rio Grande do Sul, Brazil, 2020 (N=1,288).

	Crude		Adjusted	
	RP (95%CI)	p-value	RP (95%CI)	p-value
Knowledge about COVID-19		0.590		0.533
		0.479		0.250
Regular	1.00		1.00	
Bad	1.06 (0.34, 3.34)		0.19 (0.22, 1.67)	
Good	0.74 (0.49, 1.10)		0.75 (0.47, 1.19)	
Very good/ excellent	0.80 (0.55, 1.18)		0.75 (0.50, 1.11)	
Change in working hours		0.964		0.704
Reduced	1.04 (0.77, 1.39)		1.06 (0.76, 1.49)	
Increased	1.05 (0.70, 1.57)		1.24 (0.75, 2.07)	
Impaired access to prescribed medicine		<0.001		<0.001
No	1.00		1.00	
Yes	1.94 (1.48, 2.56)		1.99 (1.44, 2.75)	
Reduced monthly income		0.086		0.868
No	1.00		1.00	
Yes	1.22 (0.97, 1.54)		1.03 (0.67, 1.60)	
Routine		0.931		0.989
Low	1.05 (0.69, 1.60)		1.01 (0.67, 1.53)	
Medium	1.00		1.00	
High	1.00 (0.63, 1.59)		0.99 (0.63, 1.56)	

*p-value for linear trend. Adjusted for: sex, age, skin color, conjugal status, highest educational achievement, body mass index, regular use of prescribed medicine, physical activity level, daily routine during social distancing, changing in working hours, and knowledge about the COVID-19 pandemic.

health burden of people with NCD during social distancing^{22,23}.

Participants with depression, which was the most prevalent NCD in our sample, and multimorbidity had worsen management of their chronic condition and more difficulty in accessing prescribed medication. The Rio Grande do Sul state has the highest prevalence of depression in the country, with proportion of cases 2.3 times greater than the national average²⁴. People living with depression could be affected by this pandemic by heightened symptoms like fear, insecurity, and loneliness²⁵. Likewise, people with multimorbidity could feel more vulnerability and fear considering that having a NCD is a risk factor to poor prognosis of COVID-19⁴. These findings reinforce the need for attention to the physical and mental impact of the COVID-19 pandemic in the population's health. As advocated by the World Health Organization since the beginning of the COVID-19 pandemic, providing continuous treatment and health services for people with NCD must be one of the priorities during this health crisis¹⁷ especially for people

with mental disorders²⁶ and multimorbidity^{27,28}.

Also, we revealed that people living with depression, high cholesterol, or diabetes were more likely to require healthcare services during social distancing supporting the need to keep these services to people with NCDs during the COVID-19 pandemic²⁹. WHO reported that this health crisis impacted health services worldwide, and consequently this fact had some immediate and short-term negative impact on people living with NCD¹⁰. Most of participants used in-person healthcare services. Further, 16.7% used virtual medical assistance, with higher proportion of people with asthma/bronchitis, high cholesterol, and arthritis/arthrosis/fibromyalgia. New forms to access healthcare services must be developed and improved in order to overcome social distancing, and request for investments in telemedicine and e-Health to supply these population in a remote form providing adequate assistance, continue medicine treatment, and avoiding unnecessary visit to health services^{10,30}.

Our findings indicate that acute economic strain was associated with impaired access to pre-

Table 4. Crude and adjusted regression analyses between impaired access to prescribed medicine during the COVID-19 pandemic and independent variables in adults diagnosed with noncommunicable diseases. Rio Grande do Sul, Brazil, 2020 (N=1,288).

	Crude		Adjusted	
	RP (95%CI)	p-value	RP (95%CI)	p-value
Sex		0.569		0.469
Male	1.00		1.00	
Female	0.87 (0.54, 1.39)		0.84 (0.53, 1.34)	
Age, years		0.051 [#]		0.184 [#]
18-30	1.00		1.00	
31-59	0.81 (0.53, 1.23)		1.00 (0.65, 1.55)	
60+	0.51 (0.25, 1.05)		0.61 (0.30, 1.23)	
Skin color		0.679		0.483
White	1.00		1.00	
Non-white	0.85 (0.41, 1.80)		0.77 (0.36, 1.61)	
Highest educational achievement		<0.001 [*]		0.001 [*]
High school or less	1.00		1.00	
University	0.49 (0.29, 0.81)		0.49 (0.29, 0.81)	
Specialization, Master, PhD	0.48 (0.31, 0.74)		0.46 (0.29, 0.74)	
Conjugal status		0.750		0.879
With partner	1.00		1.00	
No partner	1.07 (0.71, 1.59)		1.03 (0.69, 1.54)	
Region		0.918		0.897
Sul	1.00		1.00	
Centro-Oeste	0.87 (0.45, 1.71)		0.93 (0.48, 1.79)	
Norte	0.41 (0.06, 2.72)		0.52 (0.08, 3.42)	
Missioneira	0.81 (0.22, 2.98)		0.80 (0.22, 2.87)	
Metropolitana	1.01 (0.71, 1.43)		0.97 (0.68, 1.38)	
Vales	1.09 (0.48, 2.47)		1.05 (0.45, 2.46)	
Serra	1.42 (0.65, 3.13)		1.58 (0.75, 3.34)	
Reduced monthly income		0.014		0.042
No	1.00		1.00	
Yes	1.62 (1.11, 2.38)		1.49 (1.01, 2.18)	
Routine		0.899		0.836
Low	0.88 (0.48, 1.62)		0.86 (0.53, 1.41)	
Medium	1.00		1.00	
High	0.95 (0.49, 1.85)		0.87 (0.49, 1.54)	

[#]p-value for linear trend. Adjusted for: sex, age, skin color, conjugal status, highest educational achievement, region, daily routine during social distancing, and economic impact of COVID-19 pandemic.

scribed medicine and avoided seeking healthcare assistance. Decreased monthly income since social distancing has been widely reported as other indirect effect of the COVID-19 pandemic³¹. Combined with abruptly changes in daily routine, financial concern might affect mental and physical health^{25,32}. Also, impaired access to medicines may result in disrupted disease treatment and poor disease control³³, increasing the risk for preventable hospitalizations, disease complications, and death³⁴. Further, financial loss could reduce the opportunity to healthy behaviors such

as better diet and physical activity, and promoting psychological effects that might consequently impact the control of pre-existent conditions. Access to medicines is a determining factor for correct control of any NCD. It is noteworthy, however, that access to medication treatment for depression, previously the pandemic was already compromised in Brazil³⁵.

Avoid seeking healthcare assistance was higher in people living with multimorbidity, high cholesterol, arthritis/arthrosis/fibromyalgia, and heart disease with fear of contagious as the most

Table 5. Crude and adjusted regression analyses between avoiding to seek healthcare assistance in-person during the COVID-19 pandemic and independent variables in adults diagnosed with noncommunicable diseases. Rio Grande do Sul, Brazil, 2020 (N=1,288).

	Crude		Adjusted	
	RP (95%CI)	p-value	RP (95%CI)	p-value
Sex		0.149		0.205
Male	1.00		1.00	
Female	0.81 (0.61, 1.08)		0.84 (0.63, 1.10)	
Age, years		0.796 [#]		0.922 [#]
18-30	1.00		1.00	
31-59	0.94 (0.73, 1.21)		1.11 (0.83, 1.48)	
60+	0.85 (0.50, 1.44)		0.93 (0.55, 1.57)	
Skin color		0.837		0.947
White	1.00		1.00	
Non-white	1.04 (0.69, 1.57)		1.01 (0.68, 1.52)	
Highest educational achievement		0.016 [#]		0.016 [#]
High school or less	1.00		1.00	
University	0.82 (0.61, 1.11)		0.82 (0.61, 1.11)	
Specialization, Master, PhD	0.72 (0.54, 0.95)		0.72 (0.54, 0.95)	
Conjugal status		0.450		0.618
With partner	1.00		1.00	
No partner	1.10 (0.86, 1.41)		1.06 (0.83, 1.36)	
Region		0.625		0.762
Sul	1.00		1.00	
Centro-Oeste	0.94 (0.64, 1.38)		0.98 (0.66, 1.40)	
Norte	0.80 (0.31, 2.04)		1.00 (0.40, 2.49)	
Missioneira	0.53 (0.16, 1.83)		0.54 (0.15, 1.93)	
Metropolitana	1.12 (0.91, 1.39)		1.11 (0.89, 1.37)	
Vales	0.76 (0.39, 1.49)		0.75 (0.39, 1.44)	
Serra	0.75 (0.36, 1.57)		0.78 (0.38, 1.63)	
Reduced monthly income		0.002		0.003
No	1.00		1.00	
Yes	1.46 (1.14, 1.85)		1.44 (1.13, 1.83)	
Routine		0.052		0.024
Low	0.72 (0.53, 0.99)		0.72 (0.53, 0.98)	
Medium	1.00		1.00	
High	0.63 (0.43, 0.93)		0.60 (0.41, 0.87)	

[#]p-value for linear trend. Adjusted for: sex, age, skin color, conjugal status, highest educational achievement, region, daily routine during social distancing, and economic impact of COVID-19 pandemic.

common reason. Alongside the greater risk to severe outcomes in the case of COVID-19⁴, the general orientation to stay home and misjudgment from the need of healthcare assistance as not urgent, are some factors that may be associated with such findings. Nevertheless, these health conditions have distinct characteristics and healthcare needs, so the outcome to decline in-person medical assistance might worsen increasing symptoms and potentially aggravate the health status for this expressive group in our population³⁶. Strategies and actions are warrant-

ed to inform the population about the possible harmful effects of avoiding seeking healthcare assistance, and how to seek health services with safety, to minimize the risk of aggravated health conditions, especially during COVID-19 pandemic.

The present study has some limitations that must be acknowledged. First, our ambispective longitudinal design may lead to recall bias. Nevertheless, the unprecedented impact of COVID-19 pandemic on daily activities may be favorable to improve participants' ability to compare the

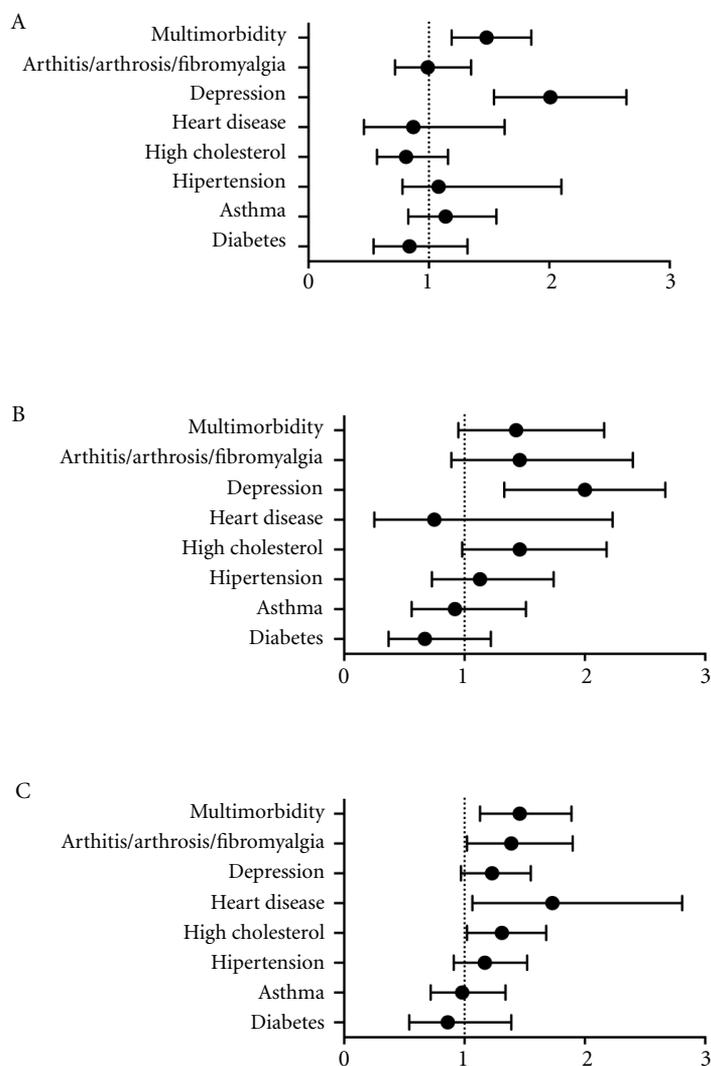


Figure 2. Prevalence ratio (95%CI) between (A) impaired management of noncommunicable diseases, (B) impaired access to prescribed medicines, and (C) avoid seeking healthcare, with independent variables in adults with chronic diseases. Rio Grande do Sul, Brazil, 2020 (N=1,288).

Adjusted for: sex, age, skin color, conjugal status, highest educational achievement, region, daily routine during social distancing, economic impact of COVID-19 pandemic. 95%CI crossing dashed line indicate non-significant association ($p \geq 0.05$).

moments before and during social distancing restrictions. Second, as face-to-face data collection was not allowed by the ethics board, a probabilistic sampling process was not possible, increasing the selection bias. However, participants included in this study had similar demographic characteristics to the general population of the Rio Grande do Sul state³⁷, improving our external validity. Lastly, the questionnaire was self-adminis-

tered which may be more prone to response bias. Nevertheless, as previously reported³⁸, self-report scales might be useful in the current scenario as they are usually short, easy to administer, and feasible to be used in social distancing. Notwithstanding the abovementioned limitations, we must highlight as strength from this present study its novelty aspect. To the moment this paper was written, no population-based study in Brazil

that aimed to identify the susceptible groups to worse NCD management during the COVID-19 pandemic was published. Then, our results contribute to highlight the high prevalence of NCD among younger adults and with a high level of education in Rio Grande do Sul state. Moreover, younger adults need equal attention to improve your health condition as older adults and elderly with NCD.

Conclusion

During the COVID-19 pandemic we demonstrated that many people with NCD had impaired management of their diseases, impaired access to prescribed medication, and many avoided seeking healthcare. These disruptions may have both immediate and long-term deleterious effects on the health of the individuals. Actions are needed to preserve the health of people living with NCDs in these difficult times of pandemic.

Collaborations

JS Leite, N Feter, EL Caputo, IR Doring, J Cassuriaga, FF Reichert, MC Silva and AJ Rombaldi: conceptualization, methodology. JS Leite and N Feter: data curation, data analysis, writing, original draft preparation. FF Reichert, MC Silva and AJ Rombaldi: supervision. EL Caputo, IR Doring, J Cassuriaga, FF Reichert, MC Silva and AJ Rombaldi: writing, reviewing and editing.

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