HEALTH SCIENCES

Longitudinal study about the impact of COVID-19 pandemic in a southern Brazilian state: the PAMPA cohort

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Abstract: This study aimed to describe the effects of social distancing due to the COVID-19 pandemic on physical and mental health, chronic disease management, and economic situation in adults from a southern Brazilian state. Data from the baseline of the PAMPA (Prospective Study About Mental and Physical Health) cohort, a population-based, longitudinal study is presented. An online-based questionnaire was used to assess the variables pre- and during social distancing. Most of the respondents (N=2,321) were women (76.7%), white (90.6%), had at least university degree (66.7%), and were overweight or obese (53.3%). Nearly 40% were not able to work from home and 45.3% had monthly income reduced during social distancing. Moderate-to-severe symptoms of depression and anxiety increased 7.3x and 8.4x from before to during social distancing. Three quarters reported low back pain (74.2%; 95%CI: 71.9%, 76.3%) during the same period while the prevalence of physical inactivity increased 31.2%. Managing chronic conditions was harder during social distancing for 28.5% of the participants. Roughly 40% reported that did not seek medical assistance even when necessary during this period. COVID-19 pandemic has disrupted the health of adults from a southern Brazilian state in several aspects.

Key words: chronic diseases, COVID-19, low back pain, mental health, exercise.

INTRODUCTION

In December of 2019, the first cases of the new coronavirus disease (COVID-19) were documented. Three months later, the World Health Organization (WHO) declared the COVID-19 a pandemic (WHO 2020a) with more than 20 million cases worldwide in mild August 2020 (Dong et al. 2020). Although an unprecedented effort has been made to develop an effective treatment and cure for COVID-19, nothing was discovered to date. In this scenario, non-pharmacological strategies such as social distancing (Wilder-Smith & Freedman 2020) and quarantine (Islam et al. 2020) have been proved as the most effective mechanisms to reduce virus spreading. Social distancing aims to reduce interaction between individuals, consequently decreasing the rate of infection and then protecting the healthcare system against a collapse (Nussbaumer-Streit et al. 2020, Wilder-Smith & Freedman 2020). This strategy is carried out by interrupting all non-essential activities and services, such as schools and gyms, and canceling sports events and concerts (Wilder-Smith & Freedman 2020).

Although effective to decrease the infection rate by the virus, social distancing might be followed by health-related side effects such as musculoskeletal pain, physical inactivity, poor mental health, and economic challenges at both

individual and community-level (Paules et al. 2020). Low back pain (LBP) affects 7.3% of the world population and is one of the main causes of physical disability and days of work lost (Vos et al. 2016). Prolonged homestay might lead to longer sitting time (Chen et al. 2020) which was recently associated with LBP (Amorim et al. 2017). Similarly, mental health was severely impacted at the global level during the COVID-19 pandemic (UN 2020). Misleading information about virus transmission, vaccines and treatment development, as well as cumulative COVID-19 cases have led to anxiety, fear, and hopelessness (Ornell et al. 2020).

Another impact of the social distancing strategy might be healthcare access to services unrelated to COVID-19. A multinational survey conducted by WHO in 194 countries revealed that in 72% of high-income countries, the COVID-19 preparedness plan included strategies to provide health services for non-communicable chronic diseases (NCD's) patients, while this proportion was only 42% in low-income countries (Dyer 2020). The same survey showed that half of the patients with hypertension or diabetes/diabetes-related complications had their treatments partially or completely disrupted during the COVID-19 pandemic. People with NCD must have access to treatment and prescribed medicines as these conditions require constant control. Disruption in health assistance for this population might result in preventable hospitalizations, aggravated health status, and increased risk for mortality.

Based on the impact of COVID-19 on different aspects of physical and mental health, the present study aimed to (1) investigate the impact of social distancing on LBP and mental health and (2) identify the impact of social distancing in managing chronic disease in adults from a southern Brazilian state.

MATERIALS AND METHODS

Study design

The study protocol was approved by the institutional research ethics board of the Escola Superior de Educação Física of the Universidade Federal de Pelotas, Brazil (protocol: 4.093.170). The PAMPA cohort (Prospective Study About Mental and Physical Health) is characterized as an ambispective longitudinal observational study that aims to examine the effect of the COVID-19 pandemic in several health outcomes in the adults from the Rio Grande do Sul state. It is the southernmost state, bordering Argentina and Uruguay and have a population size of 11.359 million inhabitants (IBGE 2019). Two-time points were used as reference for baseline data collection: a) pre-COVID-19 social distancing and b) during COVID-19 social distancing. The next waves of data collection will take place 6- and 12 months after baseline assessments. The full description of the PAMPA cohort methods can be found elsewhere (Feter et al. 2020).

Sample

Sample size was calculated based on our three primary outcomes prevalence (i.e., LBP, mental health, and healthcare access). The prevalence of depression in Rio Grande do Sul state (13.2%; 95%CI: 11.8%-15.0%) required the highest sample size (depression: N=1,359; LBP: N=960; healthcare and medication access: N=820). Calculations considered a 95% confidence interval and 1.8 percentage point sampling error. Further, we accounted for a possible lost-to-follow-up of up to 30%. Therefore, our aimed final sample size was 1,767. To achieve this required number of participants, the following inclusion criteria were established: age ≥ 18 years and be resident in the Rio Grande do Sul state.

Participant recruitment

Full description of recruitment strategies can be found elsewhere (Feter et al. 2020). Briefly, we adopted a four-arm approach to reach the sample size. First, we contacted colleagues and collaborators from universities or colleges in each mesoregion of the Rio Grande do Sul state (*Missioneira, Norte, Sul, Centro-oeste, Serra, Vales, Metropolitana,* in Portuguese*)*. These regions are used by the Secretaria Estadual de Saúde to organize the health care system in the state. A standardized message was sent to these contacts by email, with information about the survey objectives, identification of the researcher's coordinators, and a link to access the questionnaire. Second, social media campaigns on Instagram® and Facebook® were used to spread the questionnaire's link to different regions within the state. Third, local media was contacted by email and social media to inform the local population about the study. Fourth, all researchers involved in this survey shared the questionnaire's link to personal contacts spread across the state. The recruitment phase lasted four weeks.

Questionnaire

We used an online-based, self-administered questionnaire to gather data. Questions about mental health, LBP, and physical activity were asked twice to access these outcomes based on different periods (before and during social distancing). In the first moment, questions were based on pre-social distancing while the second were based on the current moment (i.e., during social distancing).

Primary outcomes

Mental health

We used the Hospital Anxiety and Depression Scale (HADS) to identify possible cases of depression and anxiety. This 14-item scale was designed to provide a simple and reliable tool to be used in both community settings and primary care medical practice (Bjelland et al. 2002, Snaith 2003). Each domain (depression and anxiety) has seven items that are scored between 0 and 3. Therefore, each domain had a maximum score of 21. Participants who scored less than 7 were classified as non-cases for that domain. Scores between 8 and 10 were considered as mild cases, between 11 and 14 as moderate, and between 15 and 21 as severe cases of depression and/or anxiety (Zigmond & Snaith 1983). Further, we added a single question about self-rated memory before and during social distancing restriction. The options for this question were "excellent/very good", "regular", and "bad/very bad". Similar questions have been used in other large cohort studies to identify subjective cognitive decline (Phelps et al. 2020, Vancampfort et al. 2017).

LBP

LBP before and during social distancing was assessed through two similar questions. An image of a person in the supine position with the low back area highlighted in a different color was used along with the following question: "*Before social distancing have you had pain in your lower back, as shown in the figure, for at least one day?*". The question related to the second time point (during COVID-19 social distancing) was similar; however, the time-reference was the current week.

Management of chronic diseases

Participants were asked about the diagnostic of chronic diseases based on a question used in the Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico (VIGITEL) (Enes & Nucci 2019). In addition, participants were asked about medicines and

healthcare assistance needed, as well as access to these services. Finally, we examined the perception about social distancing on chronic disease control (much worse, worsened, not changed, has improved, has improved a lot).

Secondary outcomes

Socioeconomic information

Age, gender (male, female, other/prefer not to mention), city of residence, ethnicity (white, black, mixed, other), marital status (with or with no partner), and the highest educational level achieved were assessed.

Impact of COVID-19 pandemic on income and work-related activities

Participants reported whether monthly income increased, decreased, or it was unchanged during social distancing. When a change was reported, participants were asked about the percentage of this variation, ranging from 10% or less to 90% or more. Questions regarding home-office and working hours before and during pandemic were also applied.

COVID-19: knowledge and attitudes

Self-rated knowledge about the COVID-19 was classified as "bad", "regular", "good", or "very good/excellent". Attitudes towards social distancing were accessed by two questions. The first was "*Regarding the social distancing that is being guided by health authorities, that is, staying home and avoiding contact with other people, how much of it do you think you are managing to do?*". The options available were "very little", "little", "somewhat", "very much" and "isolated". We further merged answers into three new categories: low: little and very little; middle: somewhat; high: very much and isolated. The second question was "*How has your daily routine at home been?*". Answering options

were grouped into the following categories: "staying at home all the time", "going out only for essential things", and "going out every day". We further asked about participants' opinions on social distancing and flexibilization of it (e.g., re-opening of schools, gyms, markets).

Physical activity

The first question was about physical activity practiced before the COVID-19 social distancing, as follow: "*Before social distancing, were you engaged in physical activity regularly?*" (Milton et al. 2011). If participant's answer was "Yes", the total days and duration (minutes) that he/she engaged in physical activity in a regular pre-social distancing week were assessed. The second question had the same format; however, the time-reference was the current week (during social distancing). This question presented a strong agreement to classify subjects as physically active (kappa=0.63, 95%CI 0.54, 0.72) compared to a longer questionnaire (e.g., Global Physical Activity Questionnaire) (Milton et al. 2011).

Data analyses

Data were exported to Stata 13.1 (StataCorp, College Station, Texas). All analyses were weighted by the total number of respondents in each mesoregion due to a higher proportion of participants from the *Sul* mesoregion (53.7%). Descriptive analyses were performed with data reported as mean or proportion and respectively 95% confidence interval (CI), when appropriate.

RESULTS

Sociodemographic profile

A total of 2,423 participants submitted the questionnaire to our database. Ten (0.4%) refused to participate so they did not fill in the questionnaire, and 92 (3.8%) lived outside

the state of Rio Grande do Sul, resulting in a final sample size of 2,321 participants. Table I describes the sociodemographic characteristics of the included respondents.

Most of the participants were women (76.6%), middle-aged (54.2%), white (90.6%), lived with a partner (61.6%), and had at least university degree (85.1%). Although 1,247 respondents were from the *Sul* region, the weighted proportion

Table I. Sociodemographic and nutritional characteristics of the included participants. Rio Grande do Sul, Brazil. N=2,321. CI: confidence interval.

	N	%	95%CI
Sex (n=2,319)			
Male	542	23.3	21.3, 25.6
Female	1,777	76.6	74.4, 78.7
Region (n=2,321)			
Sul	1,247	20.2	18.8, 21.5
Centro-oeste	176	5.7	4.9, 6.6
Norte	59	2.9	2.2, 3.7
Missioneira	48	3.1	2.3, 4.1
Metropolitana	602	48.7	46.1, 51.2
Vales	117	11.3	9.6, 13.4
Serra	72	8.1	6.5, 10.1
Age (n=2,300)			
18-30	887	37.3	34.8, 39.8
31-59	1,232	54.2	51.7, 56.8
60+	181	8.5	7.2, 10.1
Ethnicity (n=2,318)			
White	2,098	90.6	89.0, 92.0
Mixed	131	5.6	4.6, 6.9
Black	77	3.4	2.6, 4.4
Other	12	0.1	0.0, 0.1
Conjugal status			
With partner	1,406	61.6	59.1, 64.1
Living alone	915	38.4	35.9, 40.9
Highest educational achievement			
Primary	39	1.5	0.1, 2.3
Secondary	313	13.3	11.7, 15.1
Tertiary	1,969	85.1	83.2, 86.8
Body mass index (n=2,315)			
Normal	1,090	46.7	44.2, 49.3
Overweight	783	33.1	30.8, 35.6
Obese	442	20.1	18.1, 22.3

resulted in the targeted distribution based on our sample size calculation, with the highest proportion of participants from the most populous mesoregion of the state (*Metropolitana* [48.7%]).

Table II shows the information on behavior and knowledge regarding the COVID-19 pandemic. Two out of five adults in the state who were working before social distancing were not able to work from home. Nearly half (48.1% [95%CI: 45.6%, 50.7%]) of respondents related that social distancing did not affect their monthly income. However, from the 51.9% (95%CI: 49.3%, 54.4%) of participants who reported change in income during such restrictions, 87.3% (95%CI: 84.7%, 89.4%) related acute economic strain during this period, with two in five reporting a decline of at least 50%.

We further asked about commitment and opinion about social distancing recommendations. Most of the respondents (71.5%) reported that were fully committed to these preventive strategies. However, 31.2% informed that were going out their homes every day during social distancing restrictions. Notwithstanding a satisfactory self-rated knowledge about the COVID-19 pandemic and a high agreement with the social distancing actions, 37.9% agreed with the flexibilization of such restrictions.

The effects of the COVID-19 pandemic on mental and physical health are reported in Figure 1. Physical inactivity increased by 31.2% from before to during social distancing. Further, moderate-to-severe cases of anxiety and depression increased 8.4 and 7.3 times, respectively, since such restrictions. Self-rated memory as bad or very bad memory augmented 3.8-fold in the same period. Although highly prevalent in both periods (74.7% [before] and 74.2% [during]), the prevalence of LBP did not change during the pandemic in this cohort.

More than half of the participants reported the diagnoses of at least one chronic disease, as shown in Table III, with a higher prevalence of depression (18.5%), hypertension (14.3%), dyslipidemia (13.8%) and asthma (11.7%). Approximately one fourth (28.5%) reported that was more difficult to keep the pre-existent chronic disease under control during social distancing while roughly one fifth answered it was harder to access the prescribed medicine for such diseases. Among participants who needed any medical service during the COVID-19 (n=825), one in each three did not seek those services.

DISCUSSION

Using a retrospective, longitudinal design with a population-based sample, we investigated the effects of social distancing due to the COVID-19 pandemic on physical and mental health, as well as the management of chronic diseases and other demographic and economic conditions of the adult population of Rio Grande do Sul state, Brazil. We revealed that social distancing impacted deeply in economic, physical, and mental health of this population. A significant proportion of the participants reported that monthly income was reduced by at least 50%. Further, the prevalence of moderate-to-severe cases of depression and anxiety symptoms increased 8.4 and 7.3 times, respectively, during social distancing compared to the period before. LBP intensity was heightened during social distancing. Finally, we exposed the adversity in managing chronic diseases during social distancing.

Some studies have reported the impact of COVID-19 pandemic on mental health using a longitudinal design (Huckins et al. 2020, UN 2020, Pierce et al. 2020). Nevertheless, most of them were conducted in high-income countries

Table II. Knowledge and attitudes on COVID-19 pandemic in the included participants. Rio Grande do Sul, Brazil. N=2,321. CI: confidence interval.

	N	%	95%CI
Able to do home office (n=1,837)			
No	714	39.5	36.7, 42.4
Yes	1,123	60.5	57.6, 63.3
Monthly income during COVID-19[a]			
Reduced	1,029	45.3	42.7, 47.8
No change	1,134	48.1	45.6, 50.7
Increased	158	6.6	5.4, 8.0
Percentage reduced of monthly income (n=1,029)			
< 30%	351	36.5	32.9, 40.3
30-69%	480	44.7	40.9,48.5
≥70%	198	18.8	16.0, 22.0
Commitment to social distancing			
Low	202	9.2	7.8, 10.8
Medium	455	19.3	17.4, 21.4
High	1,664	71.5	69.1, 73.7
Daily routine			
Staying at home most of the time	160	7.8	6.5, 9.3
Living home only for essential activities (i.e., groceries)	1,487	61.0	58.5, 63.5
Living home every day	674	31.2	28.9, 33.7
Knowledge about COVID-19	39	1.5	0.1, 2.3
Bad	18	1.0	0.1, 1.7
Regular	200	8.1	6.9, 9.7
Good	884	37.1	34.7, 39.6
Excellent/very good	1,219	53.7	51.2, 56.3
About social distancing			
Agree (totally/ partially)	2,178	93.1	91.7, 94.4
Neutral	47	2.2	0.1, 3.1
Disagree (totally/ partially)	96	4.7	3.7, 5.9
About relaxing social distancing (e.g., re-open schools)			
Agree (totally/ partially)	821	37.9	35.4, 40.4
Neutral	88	3.9	3.0, 5.1
Disagree (totally/ partially)	1,412	58.2	55.6, 60.7

[a]Compared to before social distancing restrictions.

(i.e., USA (Huckins et al. 2020) and the UK (Pierce et al. 2020)). A survey conducted in Ethiopia showed a 3-fold increase in the prevalence of depression (UN 2020) during the COVID-19 pandemic. The constant release of COVID-19 statistics about the number of cases and deaths, an unprecedented spreading of *fake news*, and the surge of fear, uncertainty, and sadness might be associated with this heightened prevalence of mental health issues (Ornell et al. 2020). Furthermore, it is still not possible to precisely estimate the economic burden of COVID-19 due to the countless number of people infected and deaths and with the upcoming second wave of infection in some countries (Dong et al. 2020). Besides, the economic strain induced by this pandemic is distributed unevenly across the population. Five-mile queues of people seeking food assistance in the USA and more than 120 million individuals losing their jobs in India is a reality (Bauer 2020, Cénat et al. 2020). In our data, roughly 40% of respondents were not able to work from home during social distancing and 45% had the monthly income reduced in the same period. Seeking mental health services during

the pandemic either in-person or virtually is a demanding reality. Public health policies need to be tailored in order to guarantee those services will be accessible to all who need them. Mental health programs must reach those people so they can have the opportunity to copying with the COVID-19 pandemic.

Our findings indicated that in southern Brazil, healthcare services to manage chronic diseases require attention. Approximately 30% of respondents related that managing chronic diseases during social distancing were harder than the period before. Roughly one-fifth of the respondents reported a lack of access to prescribed medicines, while one third did not seek healthcare services although required. WHO has urged for supporting the treatment of NCDs during the COVID-19 crisis especially in low- and middle-income countries (WHO 2020b). Although these world regions house around 70% of all cases of chronic diseases (WHO 2015), less effort has been made to provide people access to appropriate, satisfactory-quality, continuous treatment. Even before COVID-19, less than half (48%) had guidelines for the four
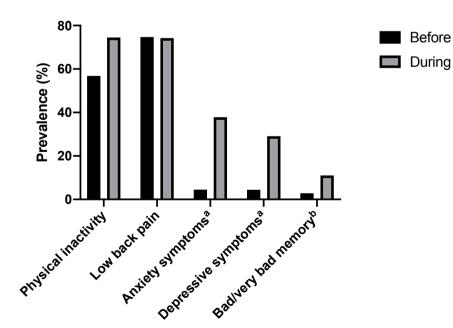

Figure 1. Physical and mental health characteristics of the sample before and during social distancing. Rio Grande do Sul, Brazil. N=2,321. [a]Moderate-to-severe symptoms. [b]Self-rated memory.

major NCDs (cardiovascular diseases, diabetes, respiratory disease, and cancer) (WHO 2020b). Data from the rapid assessment survey about NCDs among 194 countries conducted by WHO revealed that in most low- and middle-income countries, community transmission of SARS-CoV-2 has disrupted more than 60% of hypertension and diabetes treatment, and 53% of services to treat cancer. While 73% of high-income countries have sustained NCDs services in the national COVID-19 plan, this percentage drastically decreases to 42% in low-income countries and 61% in lower-middle-income countries. Disruption at any healthcare service to patients with chronic diseases may lead to uncorrectable consequences such collapse of already-overstretched healthcare systems with a higher incidence of preventable hospital admissions due to pre-existent conditions (Coraci et al. 2020). Monitoring the access to and continuity of essential health services for NCD is important and essential for preserving the health of healthcare systems.

Southern Latin America has the highest prevalence of LBP worldwide (13.47%) (Wu et al. 2020). Also, LBP is the leading cause of days lost to disability (Hartvigsen et al. 2018). A recent survey conducted in Brazil showed that, between 2012 and 2016, patients with LBP were absent from work from 83 to 100 days, on average. In this same period, US$ 460 million were invested in healthcare to treat LBP patients (Carregaro et al. 2020). Although there were no significant changes in LBP prevalence from before to during social distancing, the high frequency observed requires attention. LBP is an important public health problem, which have negative effects in people's life.

Leisure-time physical activity is a well-known protective factor for LBP (Amorim et al. 2019, Gouveia et al. 2016), several NCD's, and impaired mental health outcomes. Corroborating previous findings (Smith et al. 2020, Stanton et al. 2020), we observed a reduction in physical activity levels during social distancing. However, it should be noted that, different from countries such as Italy and Australia, Brazil did no took extreme social distancing measures, such as lockdown (Islam et al. 2020). In addition, during the period of data collection of this study, the Rio Grande do Sul state was making distancing measures more flexible, such as reopening gyms. However, even with these differences, an important reduction in physical activity levels was observed. The fear of contagious might discourage people to practice activities such as sports or attending a gym center, thus promotion of home-based exercise programs needs to be tailored at population level.

Some limitations of this study should be acknowledged. First, assessments were through self-reported, online-based questionnaires. Although this approach has some limitations, face-to-face participant-researcher is not allowed due to COVID-19 restrictions especially with at-risk population (e.g., older adults, people with NCD). Second, some of our questions are based on facts and feelings which should be reported considering the period before COVID-19-induced social distancing (approximately four months in the past). This could reproduce some memory recall bias. However, physical pain, sadness feeling, and failure to access the healthcare system are usually remarkable events. Third, as in-person interviews were not allowed, an equiprobable sampling design was not possible. However, we observed that demographic characteristics between our studied sample and population (adults from southern Brazil) are quite similar (majority white and women) (IBGE 2010).

We concluded that COVID-19 pandemic aggravated physical and mental health issues in the population from a southern Brazilian

Table III. Prevalence of chronic diseases and access to treatment during COVID-19 pandemic in the included participants. Rio Grande do Sul, Brazil. N=2,321. CI: confidence interval.

	N	%	95%CI
Chronic diseases			
No	1,033	43.1	40.6, 45.7
Yes	1,288	56.9	54.3, 59.3
Hypertension			
No	1,987	85.6	83.8, 87.3
Yes	334	14.3	12.7, 16.2
Diabetes			
No	1,698	95.6	94.4, 96.5
Yes	108	4.4	3.5, 5.5
Depression			
No	1,885	81.5	79.5, 83.4
Yes	436	18.5	16.6, 20.5
Asthma			
No	2,060	88.3	86.5, 89.9
Yes	261	11.7	10.1, 13.5
Dyslipidemia			
No	2,034	86.2	84.3, 87.9
Yes	287	13.8	12.1, 15.7
Managing chronic disease during COVID-19			
Less difficult	128	8.8	7.1, 10.9
Same	833	62.7	59.4, 65.9
More difficult	402	28.5	25.5, 31.6
Access to prescribed drug during COVID-19			
Less difficult	38	18.7	15.5, 22.4
Same	598	75.3	71.3, 79.0
More difficult	142	5.9	4.1, 8.5
Did not look for health assistance during COVID-19 even when necessary (n=825)			
No	516	62.6	58.4, 66.7
Yes	309	37.3	33.3, 41.5

state. Besides, managing chronic disease was disrupted during the same period. Strategies to mitigate the impact of the COVID-19 pandemic must be followed concomitantly by the support of mental health initiatives and ease and safe access to healthcare facilities to guarantee the correct management of the chronic disease. These approaches would preserve the healthcare system and aid in the health of the population.

Acknowledgments

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