Factors associated with the incidence and worsening of back pain during the first wave of COVID-19 in Brazil

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Abstract *The article aims to estimate the incidence and worsening of back pain (BP) during the first wave of COVID-19 in Brazil, as well as to investigate demographic, socioeconomic factors and associated changes in living conditions. ConVid – Behavior Research, applied between April and May 2020, was used as data source. The number and distribution of respondents who developed BP and those who had a worsening of the preexisting problem, their 95% confidence intervals and Pearson's Chi-square test were estimated. The odds ratio of developing BP or worsening a preexisting problem was also estimated using multiple logistic regression models. Pre-existing BP was reported by 33.9% (95%CI 32.5-35.3) of respondents and more than half (54.4%; 95%CI 51.9-56.9) had worsened. The cumulative incidence of BP in the first wave of the pandemic was 40.9% (95%CI 39.2-42.7). Being a woman, the perceived increase in housework and the frequent feeling of sadness or depression were associated with both outcomes. Socioeconomic factors were not associated with any of outcome. The high incidence and worsening of BP during the first wave reveal the need for studies in more recent periods, given the long duration of the pandemic.*

Key words *COVID-19, Spine, Health inequalities*

Introduction

The COVID-19 pandemic began in the first quarter of 2020 and quickly spread, leading to more than 6 million deaths worldwide[1], including 658,000 deaths in Brazil[2]. In addition to the alarming number of deaths, a wide range of indirect effects of the sanitary crisis impacted the Brazilian population. The loss of jobs, the decline in income levels[3], a worsening of mental health[4,5], and negative changes in the population's lifestyles[6-9] have been confirmed due to the lack of an adequate social and economic support in a scenario of strong economic crisis[3] and the restriction of physical and social contact[10].

Epidemiological studies conducted in the periods prior to the pandemic demonstrated that back problems (BP) are associated with socioeconomic, demographic, and occupational conditions, as well as to lifestyle and mental health[11-18]. The evidence shows that BPs tend to more commonly affect the populations with lower income[18] and education levels[11,15,17,18], of an older age[13,15], of the female gender[12], with infrequent physical exercise[15], and who show symptoms of depression[16].

When the BPs appear as continuous pain for three months or more, this is generally defined as a chronic condition, although there is no clear consensus on the reference period to determine chronicity[19]. In addition, other studies use different criteria to define chronicity, such as pain and the possible limitations resulting from this condition[20]. In Brazil, the nationwide studies have used the National Health Survey (NHS) as a source of information on the theme[15,17,18,21]. In the NHS, chronic back problems (CBP) is evaluated by means of a self-reported diagnosis and the questions used for measurement do not define the period when the pain occurred.

According to NHS data from 2019, the prevalence of the CBP among Brazilian adults was of 23.4%[18]. By contrast, the study conducted in the city of São Paulo between 2016 and 2018 demonstrates that 6 in every 10 individuals have already had some type of BP at some point in their lives, though not necessarily CBP[22]. Although CBP is not potentially fatal, it does represent one of the main reasons for doctors' appointments[23] and years lost due to disability[24,25].

The increase in reports and aggravations of BP during the pandemic has been shown in international studies[26,27]. However, there were no reliable nationwide sources available about how the COVID-19 pandemic affected BP in the Brazilian population. In this sense, a survey was conducted in Brazil concerning the living conditions before and after the first wave of the pandemic[28], which includes questions concerning BP.

The present study aimed to estimate the incidence of BP and the aggravation (worsening) of CBP during the first wave of COVID-19 in Brazil, as well as investigate the demographic and socioeconomic factors, together with the changes in the associated living conditions.

Methods

Data source

This study's data source was ConVid – Behavioral Study, a health survey conducted nationwide by the Oswaldo Cruz Foundation, in partnership with Universidade Federal de Minas Gerais (UFMG) and Universidade Estadual de Campinas (UNICAMP), during the period of social distancing due to the COVID-19 pandemic. The project was approved by the National Research Ethics Commission (CONEP, in Portuguese) on April 19, 2020, logged under protocol number 3.980.277. The survey was applied between April 24 and May 24, 2020, by a self-completed online questionnaire, by cell phone or by computer with access to the internet. All of the answers were anonymous and are stored in the server from the Institute of Communication and Scientific and Technological Information in Health (ICICT/FIOCRUZ). To participate in the study, the individual must be 18 years of age or older when completing the questionnaire and have resided in Brazil during the COVID-19 pandemic.

Sample

Sampling was performed using the "virtual snowball" method, by sending invitations to complete the electronic questionnaire through social medias. The final size of the sample reached 45,161 people after stratification. This sample was calibrated by means of the data from the National Household Sample Survey (PNAD, in Portuguese), from the Brazilian Institute of Geography and Statistics (IBGE, in Portuguese) in order to obtain the same distribution by state, sex, age group, race/color, and level of education of the Brazilian population. Further details on the ConVid – Behavioral Study can be found in the publication of the methodology[28], as well as on the internet research page (https://convid.fiocruz.br/).

Outcome variables

Initially, the pre-existence of CBP was defined by the affirmative answer (yes/no) to the following questions: "Do you have some type of chronic back problem, such as chronic pain in your back or neck, low back pain, sciatica pain, problems in the vertebrae or disc?" Among those who reported not having BP prior to the pandemic, the cumulative incidence of BP during the pandemic was evaluated by the following question: "During the pandemic, with the changes in your day-to-day activities, did you begin to feel some type of pain in your back or your spine?" The answer choices were: (a) yes, a little; (b) yes, a lot; and (c) no. The answers "a" and "b" were considered for the definition of the presence of the outcome. Among those who reported having a problem prior to the pandemic, the aggravation of the CBP during the pandemic was evaluated by the following question: "During the pandemic, did the changes in your day-to-day activities affect your back pain?" The answer choices were: (a) remained the same; (b) increased a little; (c) increased a lot; and (d) diminished. The answers "b" and "c" were considered for the outcome.

Exposure variables

The unmodifiable socioeconomic and demographic variables due to the pandemic that were considered in this study were: sex (female and male), age group (18-29; 30-49; 50-59; 60 years or older); pre-pandemic household per capital income (< 1 minimum salary (MS), 1-2 MS, 2-4 MS, and >= 4 MS); level of education (complete elementary education or less, complete secondary education, complete higher education or more); and race/color, categorized as white and "non-white", which consists of the combination of the following categories: black, yellow, brown, and indigenous.

This study also used the variables concerning socioeconomics, health, and living conditions that may have changed due to the pandemic. The physical exercise variable (stopped doing, reduced, increased, or maintained) was created through the original variables: "Before the new coronavirus pandemic, how many days a week did you do some type of physical exercise or practice a sport?" and "During the new coronavirus pandemic, how many days a week do you/did you do physical exercise or practice a sport?"

The answers to the variables were recoded: self-assessment of health (regular, poor, or terri-

ble; good; excellent); housework (increased a lot, increased a little, remained the same, or diminished); and felt sad or depressed (many times or always; few times; never); and the impact of the pandemic on income (diminished a lot or went without income, diminished a little, increased or remained the same). The variable of work during the pandemic was obtained through the recategorization of the answers to the question: "How did the pandemic affect your occupation/work?" The categories "paid vacation", "lost my job", and "I went without work" were added to "stopped working", while the categories "continued working" and "began to work after the pandemic" composed the new category of "worked outside the home". The categories of "continued to work" and "worked at home" remained the same.

Analysis

This study estimated the number and the distribution of participants who developed BP (cumulative incidence) and who had an aggravation (worsening) of the pre-existing problem (CBP), with the respective 95% confidence interval (95%CI), according to the described exposure variables. The distributions took into account the sample weighting. To verify the association between the observed characteristics and the outcomes, Pearson's chi-square test was used, and the respective p-values were presented. Additionally, the average age of the people who developed or who suffered a worsening of BP were estimated, whose distribution was normal. It is important to note that the cumulative incidence was calculated in a retrospective manner, given the cross-sectional design of this study.

The odds ratio (OR) to develop BP or suffer a worsening of the pre-existing condition was estimated, together with their respective 95%CI, through multiple logistic regression models in two hierarchical levels: the first considering factors that are not affected by the pandemic and the second incorporating the possible effects of the same. The analyses were carried out using the Statistical Package for the Social Sciences (SPSS), version 21, taking into consideration the sample weight obtained for the calibration of the sample.

Results

In all, this study received 45,161 answers after weighting and, of these, 44,836 answered the questions about BP (Figure 1). The pre-existing

CBP was reported by 33.9% (95%CI 32.5-35.3) of the participants (n = 15,194) and more than half (54.4%; 95%CI 51.9-56.9) reported a worsening of the medical condition (n = 8,263). Of those that had not had BP before (n = 29,642), 40.9% (95%CI 39.2-42.7) began to have BP during the pandemic (n = 12,133). The participants who developed BP or who suffered a worsening of the condition due to the pandemic, were 45.2% (95%CI 43.7-46.6) of the total sample (n = 20,396).

The cumulative incidence of BP during the pandemic was greater for women, when compared to men (48.7%; 95%CI 46.8-50.6 and 33.7%; 95%CI 30.9-36.6, respectively). This was also higher among younger individuals, especially in the age groups of 18 to 29 years (48.3%; 95%CI 45.4-51.2) and 30 to 49 years (42.6%; 95%CI 39.6-45.7). The average age of the individuals who developed BO was 38 years. As regards the socioeconomic variables, people with a lower household per capita income (< 1 MS) before the pandemic, presented a higher cumulative inci-

dence of BP than did those of the other groups (44.7%; 95%CI 42.0-47.4) (Table 1).

The living conditions affected during the pandemic also influenced the cumulative incidence of BP. People who stopped doing physical exercise presented higher incidences (47.4%; 95%CI 44.0-50.9) than those who reduced their physical exercise (36.6%; 95%CI 31.7-41.8) or who increased/maintained the frequency (39.2%; 95%CI 37.0-41.5). Those who assessed their health as regular/poor/terrible presented almost twice the incidence of BP, as compared to those with an excellent self-assessment of health (53.6%; 95%CI 49.2-58.0 and 29.1%; 95%CI; 26.0-32.5, respectively) (Table 1).

Individuals who reported a significant increase in housework (52.7%; 95%CI 48.7-56.7) presented a cumulative incidence of BP that was higher than those who remained the same or reduced their housework (31.5%; 95%CI 28.9-34.2). Among those who reported feeling sad or depressed many times or always, one in every two began to have BP (53.9%; 95%CI 50.9-56.8),
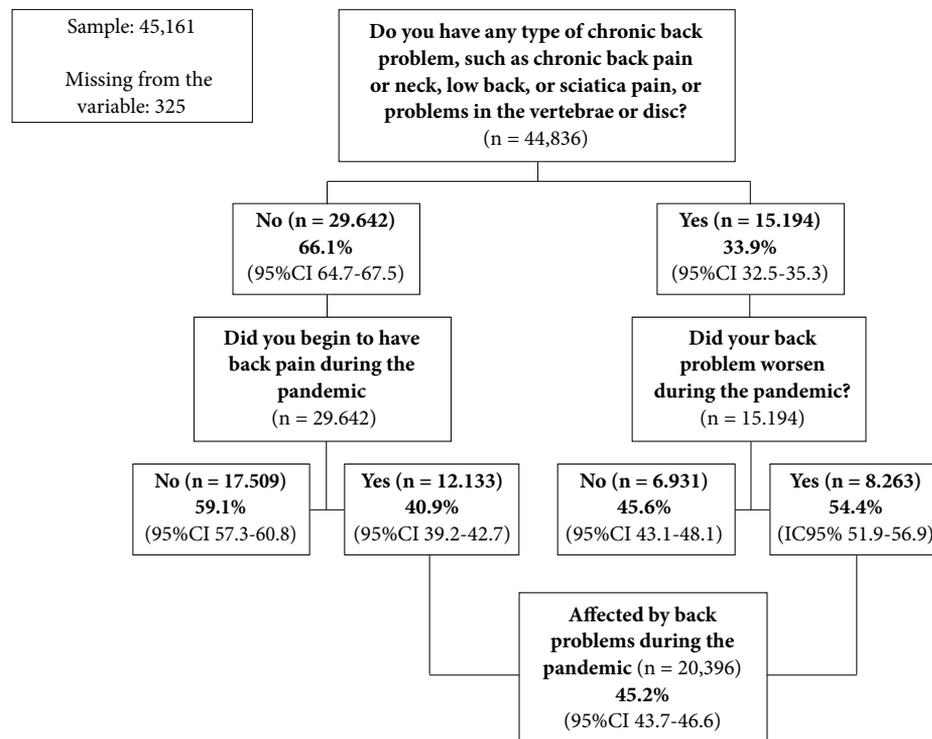
Figure 1. Flow chart of the number and proportion of individuals affected by some type of back problem during the COVID-19 pandemic. ConVid – Behavioral Study. Brazil, 2020.

Souce: ConVid – Behavioral Study, 2020.

Table 1. Proportion of the participants who began to have BP (cumulative incidence) during the COVID-19 pandemic, according to characteristics of demography, health, living conditions, and average age. ConVid – Behaviorial Study. Brazil, 2020.

Variables	Categories	P-value**	%	95%CI	n
Total without pre-existing BP (n = 29,642)		-	**40.9**	**39.2-42.7**	**12.133**
Socioeconomic and demographic characteristics					
Sex	Female	< 0.001	48.7	46.8-50.6	6,966
	Male		33.7	30.9-36.6	5,166
Age group	18-29 years	< 0.001	48.3	45.4-51.2	4,389
	30-49 years		42.6	39.6-45.7	4,826
	50-59 years		34.5	30.4-38.7	1,407
	60 years or older		29.4	25.3-33.8	1,511
Household per capita income*	< 1 MS	< 0.001	44.7	42.0-47.4	6,188
	1 - 2 MS		39.4	35.8-43.0	2,646
	2 - 4 MS		37.6	34.2-41.1	1,841
	>= 4 MS		35.3	31.5-39.3	855
Education	Complete elementary school or less	0.190	37.2	30.7-44.2	1,186
	Complete secondary school		40.9	38.7-43.1	8,770
	Complete higher education or more		43.4	42.5-44.2	2,177
Race/color	Non-white	0.197	41.9	39.1-44.7	6,939
	White		39.7	37.9-41.5	5,194
Characteristics of socioeconomics, health, and living conditions during the pandemic					
Physical activity*	Stopped doing	< 0.001	47.4	44.0-50.9	3,701
	Reduced		36.6	31.7-41.8	1,273
	Increased or remained the same		39.2	37.0-41.5	7,012
Self-assessment of health*	Regular/poor/terrible	< 0.001	53.6	49.2-58.0	3,402
	Good		40.7	38.5-42.9	6,845
	Excellent		29.1	26.0-32.5	1,884
Housework*	Increased a lot	< 0.001	52.7	48.7-56.7	2,779
	Increased a little		45.0	42.3-47.8	5,534
	Remained the same or reduced		31.5	28.9-34.2	3,762
During the pandemic, did you feel sad or depressed?*	Many times/Sempre	< 0.001	53.9	50.9-56.8	5,890
	Few times		37.6	35.0-4.1	4,665
	Never		25.0	21.2-29.3	1,552
Impact of the pandemic on income*	Reduced greatly or went without income		43.2	39.6-46.9	3,881
	Reduced a little	0.002	43.8	40.6-47.0	4,051
	Increased or remained the same		36.8	34.5-39.2	4,190
Work during the pandemic*	Continued without working	< 0.001	40.9	37.7-44.1	3,232
	Stopped working		43.6	40.0-47.3	3,317
	Worked from home		44.4	41.1-47.7	3,397
	Worked outside the home		33.0	29.5-36.6	2,047
Average age of the individuals who began to have BP			**Age**	**95%CI**	**n**
			38	37-39	**12,133**

*The difference between the n of the variable and the total of the sample corresponds to the missings (absence of answers) in the databank. **Pearson chi-square test; significant when p < 0.05.

Source: ConVid – Behaviorial Study, 2020.

a proportion twice that of those who reported never having felt this way (25.0%; 95%CI 21.2-29.3) (Table 1).

People who reported an increase in or who were able to maintain their income level presented a lower cumulative incidence of BP (36.8%;

95%CI 34.5-39.2) as compared to those who had a minimal (43.8%; 95%CI 40.6-47.0) or high reduction in income (43.2%; 95%CI 39.6-46.9). Individuals who worked outside the home presented a lower cumulative incidence of BP (33.0%; 95%CI 29.5-36.6) when compared to the other categories (Table 1).

Six in every ten women reported a worsening of CBP during the pandemic, while for men, this relation was four in every ten (61.5%; 95%CI; 58.8-64.1 and 41.9%; 95%CI 37.2-46.7, respectively). The age, though with less significant differences, showed that older people (49.8%; 95%CI 44.5-55.0) had a slightly lower proportion than the other age groups. The average age of the individuals who showed a worsening was of 46 years. Individuals with a higher level of education showed a higher proportion of the worsening of BP during the pandemic (62.3%; 95%CI 61.2-63.4) (Table 2).

The worsening of CBP was more significant among those who reduced their practice of physical exercise (63.2%; 95%CI 55.4-70.4), people with a regular/poor/terrible self-assessment of health (63.7%; 95%CI 59.5-67.7), a major increase in housework (69.4%; 95%CI 65.2-73.4), and among those who suffered from a frequent feeling of sadness or depression (65.6%; 95%CI 62.0-69.0). In relation to work, a greater proportion of people who continued to work from home showed a worsening in CBP (61.3%; 95%CI 56.9-65.5) as compared to the other categories.

In the first stage of the model (Table 3), women presented a 31% greater chance of developing BP (OR 1.31; 95%CI 1.14-1.51), while in the second stage, they presented an 18% greater chance (OR 1.18; 95%CI 1.01-1.38). Young people, aged 18 to 29 years, presented a 3-fold higher chance of developing BP in both stages, when compared to older people (60 years or older) (OR 3.21; 95%CI 2.51-4.10, OR 2.73; 95%CI 2.11-3.53, respectively).

In the second stage of the model of cumulative incidence of BP (Table 3), considering the effect of the pandemic on living conditions, individuals who stopped doing physical exercise had a greater chance of developing BP (OR 1.23; 95%CI 1.05-1.45); increased their housework, be it a little (OR 1.38; 95%CI 1.18-1.63) or a lot (OR 1.35; 95%CI 1.11-1.64); suffered the feeling of sadness or depression, be it a few times (OR 1.27; 95%CI 1.00-1.61) or frequently (OR 1.50; 95%CI 1.17-1.93); worked from home (OR 1.48; 95%CI 1.20-1.82); and continued without work (OR 1.27; 95%CI 1.02-1.58).

Women presented a greater chance of worsening their BP, both in the first (OR 2.44; 95%CI 2.03-2.93) as well as in the second stages of the model (OR 1.87; 95%CI 1.55-2.26). The younger individuals (18-29 years) were the only age group that showed a significant difference to the older people, showing more accentuated results in the second stage of the model. When considering the living conditions during the pandemic, young individuals, aged 18 to 29 years, showed nearly 70% less chances to worsen a pre-existing BP (OR 0.32; 95%CI 0.24-0.43). To the contrary of regression, which considers the cumulative incidence, the older people had a greater chance of worsening the medical condition of CBP, regardless of other conditions (Table 4).

The regular/poor/terrible self-assessment of health implied a 3-fold greater chance of a worsening of CBP (OR 3.08; 95%CI 2.34-4.06), as compared to an excellent self-assessment. Those who presented an excellent self-assessment presented greater chances of a worsening of CBP (OR 1.65; 95%CI 1.29-2.11). The accentuated and mild increase in housework during the pandemic was associated with a worsening of CBP (OR 2.01; 95%CI 1.61-2.50 and OR 1.44; 95%CI 1.18-1.75, respectively). The feeling of sadness, be it a few times (OR 1.48; 95%CI 1.08-2.01) or frequently (OR 2.43; 95%CI 1.78-3.31), also increased the chances of a worsening of CBP.

Discussion

This study presented evidence of negative effects of the COVID-19 pandemic on the incidence and worsening of BP in the Brazilian population. Nevertheless, this impact occurred in an unequal manner. Being a woman, reporting an increase in housework, and feeling sad/depressed during the pandemic were factors associated with both outcomes. Being of younger age groups proved to be associated with the incidence of BP, while a worsening in the medical condition of CBP was associated with older-aged populations. Stopping physical exercise, continuing without work, or beginning to work from home during the pandemic were the changes in living conditions associated with the emergence of BP. The regular/poor/terrible self-assessment of health during the pandemic was associated only with the worsening of CBP. The socioeconomic factors did not prove to be associated with any of the analyzed outcomes.

In Saudi Arabia, one study conducted between March and April 2020 reported an in-

Table 2. Proportion of participants who suffered a worsening of CBP during the COVID-19 pandemic, according to characteristics of socioeconomics, health, living conditions, and average age. ConVid – Behaviorial Study. Brazil, 2020.

Variables	Categories	P-value**	%	95%CI	n
Total with pre-existing CBP (n = 15,194)		-	**54.4**	**51.9-56.9**	**8,263**
Socioeconomic and demographic characteristics					
Sex	Female	< 0.001	61.5	58.8-64.1	5,958
	Male		41.9	37.2-46.7	2,305
Age group	18-29 years		54.6	47.8-61.1	1,085
	30-49 years	< 0.001	58.3	54.2-62.4	3,632
	50-59 years		52.2	47.8-56.5	1,575
	60 years and older		49.8	44.5-55.0	1,971
Household per capita income*	< 1 MS		56.6	52.6-60.4	3,928
	1 - 2 MS	0.181	51.9	46.5-57.2	1,888
	2 - 4 MS		50.6	45.5-55.7	1,194
	>= 4 MS		52.0	46.7-57.4	659
Education	Complete elementary school or less		54.3	46.2-62.1	951
	Complete secondary school	0.014	52.7	49.5-55.9	5,828
	Complete higher education or more		62.3	61.2-63.4	1,484
Race/Color	Non-white	0.827	54.1	50.0-58.2	4,305
	White		54.7	52.0-57.3	3,958
Characteristics of socioeconomics, health, and living conditions during the pandemic					
Physical activity*	Stopped doing		59.7	54.8-64.4	2,374
	Reduced	0.001	63.2	55.4-70.4	897
	Increased or maintained		50.8	47.6-54.0	4,788
Self-assessment of health*	Regular/poor/terrible		63.7	59.5-67.7	3,376
	Good	< 0.001	50.1	46.7-53.6	4,125
	Excellent		45.7	38.7-52.9	762
Housework*	Increased a lot		69.4	65.2-73.4	2,595
	Increased a little	< 0.001	55.4	51.6-59.2	3,463
	Remained the same or reduced		42.5	38.1-47.1	2,192
During the pandemic, did you feel sad or depressed?*	Many times/always		65.6	62.0-69.0	4,677
	Few times	< 0.001	47.5	43.7-51.3	2,798
	Never		36.5	29.3-44.3	778
Impact of the pandemic on income*	Reduced a lot or went without income		56.5	52.0-60.9	2,979
	Reduced a little	0.131	56.2	51.3-60.9	2,456
	Increased or remained the same		51.0	47.2-54.8	2,812
Work during the pandemic*	Continued without work		52.8	48.3-57.2	1,883
	Stopped working	0.041	52.6	47.9-57.2	2,569
	Worked from home		61.3	56.9-65.5	2,078
	Worked outside the home		52.0	45.6-58.4	1,635
Average age of the individuals who began to have BP			**Age**	**95%CI**	**n**
			46	45-47	**8,263**

*The difference between the n of the variable and the total of the sample corresponds to the missings (absence of answers) in the databank. **Pearson chi-square test; significant when p < 0.05.

Source: ConVid - Behaviorial Study, 2020.

crease in the intensity of BP among those who suffered from this medical condition, in addition to an increase in the reports of pain (incidence) during the study period[27]. Corroborating with the present study, the increase in the number of cases was associated with the changes in work-

Table 3. Odds ratio of beginning to have BP (cumulative incidence) during the COVID-19 pandemic, according to characteristics of demographics, socioeconomics, health, and living conditions. ConVid – Behaviorial Study. Brazil, 2020.

Variables	Categories	Model 1			Model 2		
		P-value*	Adjusted OR	95%CI	P-value*	Adjusted OR	95%CI
Socioeconomic and demographic characteristics							
Sex	Female	< 0.001	1.31	1.14-1.51	0.03	1.18	1.01-1.38
	Male		ref	-		ref	-
Age group	18-29 years	< 0.001	3.21	2.51-4.10	< 0.001	2.73	2.11-3.53
	30-49 years		1.81	1.42-2.30		1.64	1.26-2.13
	50-59 years		1.16	0.89-1.52		1.09	0.82-1.45
	60 years and older		ref	-		ref	-
Household per capita income	< 1 MS	0.820	1.10	0.88-1.37	0.591	1.16	0.92-1.47
	1 - 2 MS		1.02	0.82-1.28		1.07	0.85-1.35
	2 - 4 MS		1.05	0.85-1.29		1.06	0.86-1.31
	>= 4 MS		ref	-		ref	-
Education	Complete elementary School or less	0.001	0.80	0.62-1.05	0.127	0.92	0.70-1.22
	Complete secondary School		0.83	0.75-0.92		0.89	0.79-1.00
	Complete higher Education or more		ref			ref	-
Race/Color	Non-white	0.187	1.09	0.96-1.24	0.156	1.10	0.97-1.25
	White		ref	-		ref	-
Characteristics of socioeconomics, health, and living conditions during the pandemic							
Physical Activity*	Stopped doing				0.043	1.23	1.05-1.45
	Reduced					1.04	0.84-1.29
	Increased or maintained					ref	-
Self-assessment of health*	Regular/poor/terrible				0.393	1.14	0.91-1.42
	Good					1.13	0.94-1.35
	Excellent					ref	-
Housework*	Increased a lot				< 0.001	1.35	1.11-1.64
	Increased a little					1.38	1.18-1.63
	Remained the same or Reduced					ref	-
During the pandemic, did you feel sad or depressed?*	Many times/always				0.003	1.50	1.17-1.93
	Few times					1.27	1.00-1.61
	Never					ref	-
Impact of the pandemic on income*	Reduced a lot or went without income				0.491	1.04	0.87-1.25
	Reduced a little					1.10	0.94-1.29
	Increased or remained the same					ref	-
Work during the pandemic*	Continued without work				0.003	1.27	1.02-1.58
	Stopped working					1.20	0.96-1.50
	Worked from home					1.48	1.20-1.82
	Worked outside the home					ref	-

* Pearson chi-square test; significant when p < 0.05.

Source: ConVid – Behaviorial Study, 2020.

ing conditions, especially in that referent to the generalization of "home office", the diminishing of the level of physical exercise, and the increase in stress levels[27]. According to Sagat et al.[27], the restrictive measures and social distancing were responsible for changes in the way of life and individual behaviors that, consequently, raised the incidence and worsening of BP during the pandemic. Another study, conducted based on publications from Twitter in the USA demonstrated

Table 4. Odds ratio of a worsening of the pre-existing medical condition of CBP during the COVID-19 pandemic, according to characteristics of demographics, socioeconomics, health, and living conditions. ConVid – Behaviorial Study. Brazil, 2020.

Variables	Categories	Model 1			Model 2		
		P-value*	Adjusted OR	95%CI	P-value*	Adjusted OR	95%CI
Socioeconomic and demographic characteristics							
Sex	Female	< 0.001	2.44	2.03-2.93	< 0.001	1.87	1.55-2.26
	Male		ref	-		ref	-
Age group	18-29 years		0.41	0.31-0.53		0.32	0.24-0.43
	30-49 years	< 0.001	0.94	0.74-1.20	< 0.001	0.77	0.58-1.03
	50-59 years		1.03	0.81-1.30		0.89	0.68-1.17
	60 years and older		ref	-		ref	-
Household per capita income	< 1 MS		1.23	0.99-1.53		1.12	0.88-1.44
	1 - 2 MS	0.131	1.13	0.91-1.41	0.541	1.03	0.81-1.31
	2 - 4 MS		0.96	0.78-1.20		0.94	0.75-1.18
	>= 4 MS		ref	-		ref	-
Education	Complete elementary School or less		0.91	0.67-1.23		0.93	0.66-1.29
	Complete secondary School	0.351	0.92	0.81-1.04	0.526	0.92	0.80-1.07
	Complete higher Education or more		ref	-		ref	-
Race/Color	Non-white	0.111	0.88	0.76-1.03	0.056	0.86	0.73-1.00
	White		ref	-		ref	-
Characteristics of socioeconomics, health, and living conditions during the pandemic							
Physical Activity*	Stopped doing					1.22	1.02-1.46
	Reduced				0.091	1.14	0.89-1.47
	Increased or maintained					ref	-
Self-assessment of health*	Regular/poor/terrible					3.08	2.34-4.06
	Good				< 0.001	1.65	1.29-2.11
	Excellent					ref	-
Housework*	Increased a lot					2.01	1.61-2.50
	Increased a little				< 0.001	1.44	1.18-1.75
	Remained the same or Reduced					ref	-
During the pandemic, did you feel sad or depressed?*	Many times/always					2.43	1.78-3.31
	Few times				< 0.001	1.48	1.08-2.01
	Never					ref	-
Impact of the pandemic on income*	Reduced a lot or went without income					1.01	0.82-1.26
	Reduced a little				0.910	1.05	0.85-1.28
	Increased or remained the same					ref	-
Work during the pandemic*	Continued without work					0.85	0.65-1.11
	Stopped working				0.499	0.93	0.71-1.22
	Worked from home					1.01	0.78-1.31
	Worked outside the home					ref	-

* Pearson chi-square test; significant when p < 0.05.

Source: ConVid – Behaviorial Study, 2020.

that, between November 2019 and November 2020, there was an 84% increase in reports of BP in social media[26].

The higher incidence of BP or the worsening of CBP among women, observed in the present study, showed that the pandemic affected the different genders in a unequal manner. However, this inequality is not new to the pandemic, given that studies conducted in previous periods had already reported that BP more common-

ly affected women[12,17]. The explanation for such evidence appears in many ways in the literature, which presents from genetic and biological explanations, such as the musculoskeletal structure, menstruation, osteoporosis, and pregnancy[24], to social explanations[29,30]. In the latter case, it is clear that, for cultural reasons, women end up taking on greater responsibility in the house and maternal work, which, at the same time, means a greater workload[29] and less free time to relax and exercise[30]. The social distancing measures kept people inside their houses for longer periods of time, and with this, many women found themselves obliged to concomitantly perform paid and unpaid work, a fact that caused a physical and psychological overload in this group[31]. In this light, it is reasonable to assume that these were the most relevant factors that led to the unequal impact of the pandemic on BP between the two sexes.

The association of the higher chances of incidence of BP among the younger populations, as well as the greater chances of a worsening of pre-existing cases among older-aged individuals is also in line with previous findings[13,17]. The average age found among those who developed BP (38 years) is near the average age for the development of CBP in Brazil from 2013 (35 years), according to findings from Romero et al.[17] The authors also pointed out that the prevention of BP should be intensified and carried out especially in younger-aged individuals[17]. Dionne et al.[13], in a systematic review, affirmed that the cognitive involvement, the increase in comorbidities, and the greater resilience to pain are possible hypotheses for the stability of the prevalence of BP in older populations. However, with advancing age, the severity of CBP is accentuated by the emergence of the limitations in one's daily life activities (DLA) as of 50 years of age[17], considering that the degree of limitation is associated with the intensity of the pain[32].

According to data from the ConVid study, nearly 60% of the adult population reported a reduction in the level of physical exercise[8]. It is well-known that the regular practice of physical exercise is a key factor for the prevention of BP[33]. In this sense, the association between the reduction in the level of physical exercise and the greater incidence of BP, reported herein, was expected. It is important to highlight that, although doing physical exercise can be considered an individual behavior, this condition is prone to public health interventions, such as incentive policies and programs. Primary Health Care (PHC), through

health advice strategies[34] and the assisted practice of physical exercise[35], has been responsible for the promotion of a more active lifestyle within the population. Such strategies have the potential to be used, even if at online (via telemedicine), to minimize the harmful effects of the pandemic on the incidence of the medical condition of BP. Nevertheless, the known underuse of the PHC in Brazil to combat the pandemic[36], coupled with setbacks and impairments stemming from the new National Basic Health Policy[37], have undermined the ability of SUS to effectively implement these strategies.

The association between the poor self-perception of one's state of health and the occurrence of CBP was also shown in a previous study[17]. In the present study, the variable proved to be associated with a worsening of CBP, but not to the appearance of BP. This result is likely associated with the time in which the individual lived with the problem, given that the presence of chronic morbidities can lead to significant losses in one's quality of life, which in turn leads to a poor self-perception of health[38].

The increase in housework during the first wave of the pandemic was associated with a higher prevalence of a worsening in the medical condition and the emergence of BP. Housework is a well-known risk factor for BP[39,40]. Cleaning, cooking, washing and ironing clothes, and taking care of the children can demand a lot, or even more, physically than some formal types of work[40]. The association with BP results from fatigue, produced through the long shifts that housework tends to demand, of work in inadequate postures, and of the action of repetitive movements[41]. Work that studies the impacts of the pandemic on housework have reported that the workload increased for the population in general, but with a greater burden among women[42,43], reinforcing the hypothesis that this can be a factor associated with worse conditions related to BP during the period.

In this study, the feeling of sadness or depression has also proven to be associated with BP, especially with the worsening of CBP. Nevertheless, the causal relationship is not necessarily one-way. According to what Hurwitz et al.[16] propose, the psychological suffering is not only a possible cause, but also the consequence of BP, that is, it presents a relationship of interdependence. In this sense, it is possible to hypothesize that the high incidence, prevalence, and aggravation rates of the BP cases reported here, as well as the impact of the pandemic on one's state of

mind, stress, and mental state of the populations in Brazil[4,5] and in the world[44,45], can mutually be one of the causes of the increase perceived in each of these conditions.

The changes related to the workplace due to the pandemic also showed an association with the incidence of BP. Those who began to work from home presented greater chances of developing BP. These findings corroborate with those of a study conducted in Turkey, which illustrated that people who began to work home office showed significantly higher rates of BP than did those who continued to work in their regular workplaces[46]. Another study, which examined a wide range of manifestations of pain among individuals who began to work home office during the pandemic, reported that BP was the most common among all of the studied manifestations[47]. Two hypotheses can be raised concerning the causes of these manifestations. The first of these concerns the prolonged time in which the individuals spend seated, which implies a lack of activation of the lower back muscle[48]. Another factor consists of the improvisation of home office spaces, without adequate chairs and office furniture, without proper pauses, and with a clear increase in the workload among those who work remotely[49]. This overload can affect the individual, both directly, through the even longer exposure to the seated position, as well as indirectly, through the mental overload, which in turn leads to higher levels of stress[50].

Another proven scenario is that those who did not work either before or after the beginning of the pandemic also presented higher chances of developing BP. This may be more difficult to justify, given that this population did not go through changes related to work due to the pandemic. Nonetheless, it can be inferred that this association may well be related to psychological factors and to their despair within the work market, worsened by the economic crisis and the consequent development of other diseases, such as depression, heavily associated with the prevalence of CBP[17].

In Brazil, a high prevalence of CBP was found (33.9%) at the beginning of the pandemic as compared to data from the 2019 NHS (23.4%)[18]. If this prevalence is added to the incidence during the period, one can reach a proportion of 61% of Brazilians with some type of BP during the pandemic. One should consider that the ConVid Study was applied between April and May 2020 and that the pandemic had been ongoing for more than two years. Thus, one can expect that a significant part of those who began to have back problems during the pandemic will most likely develop CBP as well.

If this scenario is confirmed, the country will become misaligned with the main guiding principles of the global strategy of "Decade of Healthy Aging, 2020-2030", proposed by the World Health Organization (WHO), considering that the key concept to understand healthy aging is the functional skill, that is the capacity (physical and mental) of individuals to interact with the environment in which they live. This perspective will certainly be compromised by the disability promoted by the increase in the number of cases and by the worsening of CBP. In other words, the main cause of years lost due to disability, according to the Disease Burden study, will still be significant[24]. There is also strong evidence that COVID-19 itself can present musculoskeletal symptoms, among which is BP[51], which would cause twice as much harm (direct and indirect) in the condition studied within the pandemic scenario.

As this study was conducted on the internet, the populations with a lower level of education and without access to the internet may have been under-represented in the ConVid Study sample. Nonetheless, the large sample number and the subsequent weighting with the 2019 Continuous PNAD data minimize this limitation[28]. Other limitations of this study refer to the questions used to measure the outcomes of this study. First, the question used to identify the presence of CBP does not define a minimum time to consider chronicity, which may have overestimated the prevalence[25], making it difficult to perform a comparative analysis with international studies[19]. By contrast, as it was described in this sense in the NHS, it was possible to compare the question with national studies[15,17,18].

As regards the questions used to measure the incidence and worsening of BP, one other limitation is that the ConVid Study presumes that, with the pandemic, all of the participants had changes in their day-to-day activities, which can lead to more reports of BP among the participants. Finally, the question used to measure the incidence lists less definitions for BP than used to identify CBP, which may have generated an under-estimation of the incidence. Despite these limitations, the comparison made with data from the NHS[28] demonstrates the robustness and relevance of the results, faced with the unavailability of other sources of up-to-date and nationwide information about BP.

Finally, the present study's findings demonstrate that the first wave of the COVID-19 pandemic increased BP among Brazilian adults, especially among women, as well as among those who felt sad/depressed and those who had an increased burden in housework. Therefore, it is necessary to reinforce policies to promote physical and mental health in the scope of PHC and improve access to adequate treatment for BP.

Collaborations

DE Romero contributed with the conception, curation of the database, analysis, interpretation, writing and revision of the manuscript; J Muzzy contributed with the curation of the database, analysis, interpretation, writing and revision of the manuscript; LR Maia contributed with the conception, analysis, interpretation, writing and revision of the manuscript; WS Almeida contributed with the curation of the database, interpretation and revision of the manuscript; DRP Silva contributed with the analysis, interpretation and revision of the manuscript; DC Malta contributed with the interpretation and revision of the manuscript and PRB Souza Junior contributed with the manuscript analysis and revision.

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