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Sedentary Behavior During The COVID-19 Pandemic: An Electronic Survey Study In A Brazilian Small Urban Center

Conducta sedentaria durante la pandemia de COVID-19: Un estudio de encuesta electrónica en un pequeño centro urbano de Brasil

Comportamento sedentário durante a pandemia de COVID-19: um estudo por meio de pesquisa eletrônica em um pequeno centro urbano brasileiro

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ABSTRACT

Introduction: It is unclear how public health restrictions due to the COVID-19 pandemic have influenced the sedentary behavior (SB) of adults in small urban centers. **Aim:** This study analyzed the SB of adults before and during the COVID-19 pandemic in a small urban center located in Brazil's Northeast region. **Methods:** An electronic survey was carried out using the non-probability sampling method, in which 76 respondents (76.7% women, 18-57 years) met the eligibility criteria. SB was evaluated as the time spent (h/day) in a sitting or reclining posture activities (domains: Work/study; Leisure; TV; and Commuting). **Results:** The prevalence of SB was high both before (60.5%) and during the pandemic (59.2%), with no significant difference, regardless of the domain (*P*>0.05). Total time in SB before (9.4 h/day) and during (10.6 h/day) the pandemic was statistically similar (Δ= +12.3%, *P*= 0.465). **Conclusion:** Despite the high prevalence of SB, public health restrictions imposed during the pandemic of COVID-19 did not appear to significantly alter SB patterns among the population under analysis.

Keywords: COVID-19, exercise, sedentary behavior, social isolation

RESUMEN

Introducción: No está claro cómo las restricciones de salud pública, debido a la pandemia de COVID-19, han influido en la conducta sedentaria (CS) de los adultos, en pequeños centros urbanos. **Objetivo:** Este estudio analizó la CS de adultos antes y durante la pandemia de COVID-19, en una pequeña ciudad ubicada en la región noreste de Brasil. **Métodos:** Se realizó una encuesta electrónica, en la que 76 personas encuestadas (76,7 % mujeres, 18-57 años) cumplieron con los criterios de elegibilidad. Se evaluó la CS como el tiempo dedicado (h/día) a las actividades posturales sentado o reclinado (dominios: trabajo/estudio; ocio; TV; y transporte). **Resultados:** La prevalencia de CS fue alta tanto antes (60,5 %) como durante la pandemia (59,2 %), sin diferencias significativas, independientemente del dominio (*P*>0,05). El tiempo total en CS antes (9,4 h/día) y durante (10,6 h/día) la pandemia fue estadísticamente similar (Δ= +12,3%; *P*= 0,465). **Conclusión:** A pesar de la alta prevalencia de la CS, las restricciones de salud pública impuestas durante la pandemia de COVID-19 no parecieron alterar, significativamente, los patrones de sedentarismo entre la población analizada.

Palabras clave: aislamiento social, comportamiento sedentario, COVID-19, ejercicio físico

RESUMO

Introdução: Não está claro como as restrições de saúde pública devido à pandemia de COVID-19 influenciaram o comportamento sedentário (CS) de adultos em pequenos centros urbanos. **Objetivo:** Este estudo analisou o CS de adultos antes e durante a pandemia de COVID-19 em uma pequena cidade localizada na região Nordeste do Brasil. **Métodos:** Foi realizada uma pesquisa eletrônica, na qual 76 participantes (76,7% mulheres, 18–57 anos) atenderam aos critérios de elegibilidade. O CS foi avaliado como o tempo dedicado (h/dia) a atividades em postura sentada ou reclinada em diferentes domínios: trabalho/estudo, lazer, TV e transporte. **Resultados:** A prevalência de CS foi alta tanto antes (60,5%) quanto durante a pandemia (59,2%), sem diferenças significativas, independentemente do domínio (P>0,05). O tempo total em CS antes (9,4 h/dia) e durante (10,6 h/dia) a pandemia foi estatisticamente semelhante (Δ= +12,3%; P=0,465). **Conclusão:** Apesar da alta prevalência de CS, as restrições de saúde pública impostas durante a pandemia de COVID-19 não pareceram alterar significativamente os padrões de sedentarismo na população analisada.

Palavras-chave: comportamento sedentário, COVID-19, exercício físico, isolamento social

Introduction

Sedentary behavior (SB) has attracted considerable critical attention because it has different health implications (Ekelund *et al.*, 2019; Rocha *et al.*, 2019). This behavior is related to activities with low energy expenditure (≤1.5 MET) or time spent while in a sitting, reclining, or lying posture, usually using electronic devices (screen time: smartphone, tablet, computer, TV, etc.), which includes most desk-based occupational settings (Ekelund *et al.*, 2019; Leão, Knuth, & Meucci, 2020). A high SB increases the risk of cardiometabolic diseases, cancers, symptoms of anxiety and depression, and all-cause mortality, besides predisposing to an increase in body adiposity (Barbosa *et al.*, 2024; Croci *et al.*, 2019; Dempsey *et al.*, 2020; Katzmarzyk *et al.*, 2019; Pandey *et al.*, 2016). In this context, different institutions have recommended actions to reduce the population's SB (Katzmarzyk *et al.*, 2019; World Health Organization, 2020).

In Brazil, a population survey has reported that approximately 22% of the adult population has the habit of watching TV for three or more hours a day (Instituto Brasileiro de Geografia e Estatística, 2019). Previously, in the US, a 14% increase in the risk of mortality for every 2 h/day of TV watching was observed among people aged 50 to 71 years (Keadle *et al.*, 2015). Other investigations have also found a higher risk of mortality in groups with high SB (≥8 h/day sitting) (Patterson *et al.*, 2018; Stamatakis *et al.*, 2019). Furthermore, SB has been associated with unhealthy behaviors (Malta *et al.*, 2021; Malta *et al.*, 2020; Trindade & Sarti, 2021; Werneck *et al.*, 2021), which represents an additional concern for public health worldwide (Katzmarzyk *et al.*, 2019; World Health Organization, 2020).

SB has become even more of a central issue due to the multiple public health restrictions related to the new coronavirus disease pandemic – COVID-19 (e.g., social distancing and closing of places where physical activity is practiced). For instance, values greater than or equal to 3 hours/day of SB across the domain of leisure (TV) were reported by Brazilian adults living in capitals during the pandemic (Mendes *et al.*, 2019). Brazilian cross-sectional studies also point to an increase in screen time during this period (Malta *et al.*, 2021; Malta *et al.*, 2020). More recently, employees in desk-based work at a university in a Brazilian regional metropolis spent more than 10 h/day on sitting behavior (Brusaca *et al.*, 2021). Thus, it is assumed that given the numerous recommendations for SARS-CoV-2 infection control, most of the population has accumulated, until then, sedentary behaviors.

Considering that SB has different determinants (e.g., environmental, sociocultural), the current scenario still raises the question of how public health restrictions have promoted the increase of this type of behavior in adults from small urban centers (≤50,000 inhabitants), such as Jacaraú, Paraíba, Brazil. In this context, the aim of the study is to analyze the SB of adults before and during the COVID-19 pandemic in a small urban center located in Brazil's Northeast region. The hypothesis is that, compared to the previous moment, SB increased during the COVID-19 pandemic. This study can contribute to the population's awareness of the practice of lifestyle behaviors, in addition to favoring the development of public health policies, especially for small urban centers where scientific investigations are scarce.

Method

Study design

This survey study describes the characteristics of SB in a group of adults in Jacaraú-PB (Portney & Watkins, 2015). To achieve the proposed objectives and test the hypothesis that SB increased during the COVID-19 pandemic, an electronic form with a retrospective approach was used. The study was carried out between March and April 2022. During that period, the municipality had a total of 27,195 doses of vaccines applied against COVID-19. At the time, the city's epidemiological bulletin indicated a vaccination coverage of 12,680 with the first dose, 11,210 with the second, and 3,305 vaccinated with the third dose.

The municipality of Jacaraú is located in the region of Vale do Mamanguape, in the Paraíba state (located in Brazil's Northeast region). According to the Brazilian Institute of Geography and Statistics (2021), Jacaraú has a demographic density of 55.1 inhabitants/km^2 and 13,942 inhabitants in the last census (data from 2010), in addition to an estimated population of 14,467 inhabitants in 2021. These records also indicate a human development index – HDI of 0.558. The dimensions that contributed the most to the index were life expectancy (0.720), followed by per capita income (0.554), and education (0.435) (United Nations Development Programme, 2010).

Participants and ethics issues

The target population consisted of adults (18-44 years) of both sexes, living in Jacaraú-PB. The non-probability sampling method was employed based on the geographic area and accessibility of the participants to electronic forms. The following

individuals were excluded from the study: i) those residing in rural areas; ii) those who fit into the risk group according to the guidelines and standards of the Ministry of Health (e.g., individuals with metabolic disorders; heart disease; lung disease; pregnant and puerperal women and people with tuberculosis); iii) those who were working remotely; or iv) those whose responses were incomplete or questionable (e.g., reporting body mass of 13 kg).

The study was approved by the local ethics committee (CAAE: 55197722.3.0000.5179), with access to the form only after voluntary acceptance through an informed consent form, following the Resolution 466/12 of the National Health Council.

Procedures

For participation in the study, an access link was made available through social networks (e.g., WhatsApp, Instagram, Gmail). An electronic form with questions about sociodemographic aspects (e.g., age, sex, education level) and SB related to the pre-pandemic and current moments of COVID-19 (e.g., time spent sitting/lying down during the day; time of use of electronic devices such as smartphones, tablets, computers), which required approximately 15 min to complete, was used.

As for sociodemographic aspects, self-reported information on age, height, body mass, skin color, marital status, education level, sex, presence of chronic disease, and type of work were collected.

SB was evaluated considering the daily time (h/day) spent in activities in the sitting or reclining postures based on the adaptation of the questionnaire by Cafruni *et al.* (2020). This instrument showed adequate test-retest reliability, with moderate to high correlations for total SB (r= 0.79) and in the leisure (r= 0.79), occupation (r= 0.82) and commuting (r= 0.60) domains (Cafruni *et al.*, 2020). The domains of SB were: Work/Study (Occupation), Leisure, TV, and Commuting. To estimate SB before the COVID-19 pandemic, exclusive questions were created asking participants to report time on SB in the period immediately preceding the pandemic (e.g., Estimate how much time per day you spent sitting/reclining using the computer, tablet or smartphone at home to study/work before the COVID-19 pandemic?). The same type of question was used to estimate the SB during the COVID-19 pandemic, however, analyzing the SB in the last week (e.g.: Estimate how much time per day you spent sitting/reclining using the computer, tablet, or smartphone at home to study/work in the last week?). SB was classified as high when the time sitting or lying down watching TV was greater than or equal to 4 h/day (Werneck *et al.*, 2019).

Data analysis

Regarding statistical analysis, data on demographic characteristics were presented by absolute (n) and relative (%) frequency. Percentage changes in SB between time points were calculated as Δ (%) = [(POST − PRE)/PRE] × 100). The prevalence of SB was compared between the moments immediately before and during the COVID-19 pandemic using the McNemar test (χ^2). In addition, SB time data were reported by estimated mean and standard error, whose comparison between the pre and during moments was performed by the Generalized Estimating Equations model (gamma distribution with loglink and AR1 correlation structure), adjusted for sex and education level, and expressed by Wald statistics (χ^2_{Wald}). The analysis was performed using the IBM Statistical Package for the Social Sciences (SPSS) program, version 25.0 (IBM Corp., Armonk, USA), and the statistical significance was set at $P<0.05$.

Results

Of the 117 respondents, only 76 met the eligibility criteria and had their data analyzed. The predominant sociodemographic characteristics were (Table 1): female (76.7%), single (71.1%), complete higher education (35.5%), followed by complete secondary education (30.3%), and, finally, brown color (56.6%). As for the self-reported anthropometric characteristics, the mean (SD) age, body mass, and height were, respectively, 27 (8) years, 70.7 (19.0) kg, and 161.8 (20.6) cm.

Table 1
Sociodemographic characteristics of adults of both sexes, living in Jacaraú-PB, in Brazil's Northeast region (n= 76).

Variable	n (%)
Sex	
Male	17 (22.4)
Female	59 (77.6)
Marital status	
Single	54 (71.1)
Married	17 (22.4)
Divorced	4 (5.3)
Widowed	1 (1.3)

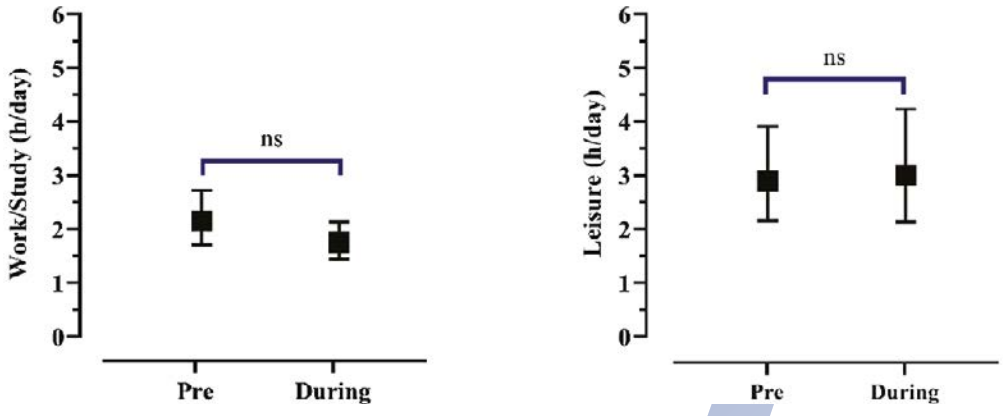
Variable	n (%)
Education (years)	
0 a 5	4 (5.0)
6 a 9	1 (1.6)
10 a 14	44 (57.9)
≥ 15	27 (35.5)
Skin color	
White	28 (36.8)
Black	5 (6.6)
Brown	43 (56.6)

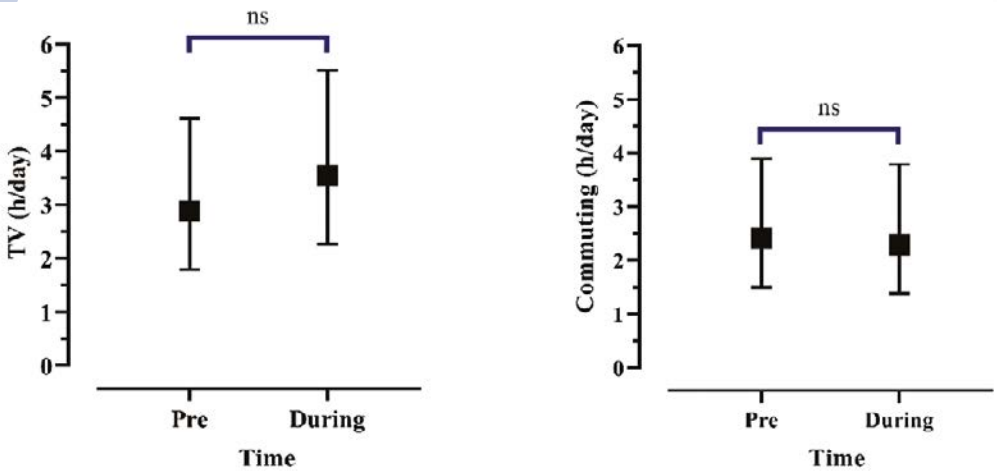
Note. Data presented by absolute (n) and relative (%) frequency.

The prevalence of SB was 60.5% and 59.2%, respectively, for pre- and during the COVID-19 pandemic (χ^2= 0.000; *P*= 1.000). The total time spent in SB before (9.4 h/day) and during (10.5 h/day) the pandemic was statistically similar (Δ= +12.3%; χ^2_{Wald} = 1.53; *P*= 0.465). The same occurred for the different domains, with only slight reductions observed for the Work/Study domains (Δ= −18.6%; χ^2_{Wald} = 2.054; *P*= 0.358) and Commuting (Δ= −5.8%; χ^2_{Wald} = 0.786; P= 0.675) and slight increases in SB in the Leisure domains (Δ= +3.8%; χ^2_{Wald} = 0.190; *P*= 0.910) and TV (Δ= +22.8%; χ^2_{Wald} = 2.598; *P*= 0.273) (Figure 1).

Figure 1

Time of sedentary behavior in hours per day (h/day) of adults of both sexes living in Jacaraú-PB (Brazil), before (Pre) and during the COVID-19 pandemic in different domains (n= 76).





Note. Data reported by estimated mean and standard error. Analysis adjusted for sex and education level. ns, not significant (P>0.05).

Discussion

The current study is one of the pioneers in analyzing the SB of adults in the pandemic context in small urban center, whose dynamics are significantly different from those of main centers and capitals in Brazil. The hypothesis that SB increased during the COVID-19 pandemic, compared to the previous moment, was refuted. The main findings point to a high prevalence of time in SB and, considering the temporal context of this study, the public health restrictions due to the COVID-19 pandemic do not seem to have affected the SB of adults in Jacaraú-PB, Brazil.

Previous studies have reported that the pandemic affected the duration of physical activity, which corroborates the increase in SB (Borghi-Silva *et al.*, 2022; Botero *et al.*, 2021; Brusaca *et al.*, 2021; Mendes *et al.*, 2019; Santos *et al.*, 2021). Another electronic survey study, carried out in Brazil, reported that the average time spent in SB increased by 2.5 h/day during the pandemic (Schuch *et al.*, 2022), while a recent meta-analysis identified an increase of approximately 2.1 h/day (Runacres *et al.*, 2021), against 1.1 h/day in our investigation. These divergences may be related to the determinants of SB, justified by the lower possibility of spaces for entertainment, practice of physical activities, cultural opportunities, and distance from the workplace in small urban centers.

When analyzing the SB domains separately, the data for time sitting or lying down watching TV showed great variability around the estimated mean. This is one of the reasons that may have limited the statistical analysis for the detection of differences between pre- and during the COVID-19 pandemic in our study. Even so, it is worth noting that the main SB indicator (domain related to TV) indicated a high prevalence of SB even before the COVID-19 pandemic, with a slight increase during the pandemic period. These results corroborate other Brazilian investigations in which screen time has increased significantly in this period (Malta *et al.*, 2021; Malta *et al.*, 2020).

The analyzed group consisted predominantly of young adult women. Overall, some evidence suggests that male adults are more likely to have high SB (Diaz *et al.*, 2016; López-Valenciano *et al.*, 2020; Romero-Blanco *et al.*, 2020). However, a recent meta-analysis demonstrated a similarity between men and women in SB time during the COVID-19 pandemic (Runacres *et al.*, 2021). Furthermore, it is well known that the higher the level of education, the higher the level of physical activity. Although little studied, this premise seems to be valid for SB. In this scenario, the high prevalence of SB seems to have equally affected all participants in our investigation, since most reported significant years of study.

It is known that SB is an independent short- and long-term risk factor for different chronic diseases and all-cause mortality (Dempsey *et al.*, 2020; Katzmarzyk *et al.*, 2019; Pandey *et al.*, 2016; Patterson *et al.*, 2018; Stamatakis *et al.*, 2019). In addition, an increase in SB due to the public health restrictions of COVID-19 may further improve unhealthy behaviors (Martinez-Ferran *et al.*, 2020; Trindade & Sarti, 2021; Werneck *et al.*, 2021). Therefore, it is speculated that the sum of these modifiable factors could raise the risk of severe COVID-19 and other negative health outcomes (Martinez-Ferran *et al.*, 2020). This study reinforces the importance of reducing the time in SB, especially since SARS-CoV-2 also directly affects chronic conditions (Liu *et al.*, 2020; Sallis & Pratt, 2020; Silva *et al.*, 2020), which would provide better control and/or treatment of COVID-19.

The current investigation used the survey method with a retrospective approach. This method is efficient over a wide geographical distribution in a relatively short time at minimal expense, although it has disadvantages when studying behaviors that require direct observation (Portney & Watkins, 2015). Moreover, a retrospective approach can be a problem when respondents are asked to remember past events (recall bias) and it may have affected the data accuracy (Portney & Watkins, 2015), especially in the pre-pandemic period. Despite this, information about the SB of adults, in a small urban center, can be useful for the elaboration of public policies to raise awareness of the

implications of a high SB. Thus, urban planning, health promotion campaigns, and interventions aimed at specific population groups can be better developed.

Conclusion

Considering the temporal context of this study, it is concluded that despite the high prevalence of SB, public health restrictions imposed during the pandemic of COVID-19 did not appear to significantly alter SB patterns among the population under analysis.

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Author's contribution statement

All the authors have had the same degree of contribution to the elaboration of the article, either from its conceptualization and design, data analysis or interpretation, writing and critical review or quality control for its publication.