IJMSR

Original Article

# Physical activity level of the Itumbiarense population during the period of social restriction (COVID-19)

**Alfredo Guilherme Lara Serafim[1], Vitória Karine Oliveira Cordeiro[1], Rossana Cândido Ribeiro[1], Bruno Siqueira Furtunato Silva[1], José Nildo Virgulino de Andrade Filho[1], Brenda Maryana Zandonade Gonçalves[1], Marcello Pasenike Rocha[1], Weder Alves da Silva[1,2]***

[1] Instituto Luterano de Ensino Superior de Itumbiara – Goiás – ILES/ULBRA.
[2] Graduate Program in Pharmaceutical Sciences, Pharmacology and Therapeutics, Evangelical University of Goiás, Anápolis, Brazil
* Correspondence: proffweder@gmail.com

## Abstract

**Background:** Regular physical activity is an important strategy for health promotion and the prevention of chronic diseases. However, during the COVID-19 pandemic, social restriction measures may have reduced opportunities for physical activity and contributed to unfavorable lifestyle behaviors. Local assessments are necessary to understand how these changes affected specific populations. **Objective:** The primary objective of this study was to identify the physical activity level of the population of Itumbiara, Goiás, Brazil, during the period of COVID-19-related social restriction. The secondary objective was to assess body mass index (BMI) and compare BMI values between men and women. **Methods:** This was a descriptive cross-sectional study conducted between March and May 2021. A total of 215 adults of both sexes, aged 18 to 65 years and residing in Itumbiara, were recruited by non-probabilistic convenience sampling. Physical activity level was assessed using the short version of the International Physical Activity Questionnaire (IPAQ), which classified participants as sedentary, irregularly active B, irregularly active A, active, or very active. Body mass and height were self-reported and used to calculate BMI. Data are presented as mean ± standard deviation and percentages. BMI values were compared between men and women using the independent samples t-test, with significance set at $p \leq 0.05$. **Results:** Of the 215 participants, 101 were men and 114 were women. The sample had a mean age of 36.33 ± 14.32 years among men and 36.13 ± 14.45 years among women. Regarding physical activity level, 33% of participants were classified as active, 26% as sedentary, 24% as irregularly active A, 10% as very active, and 7% as irregularly active B. The overall mean BMI was 25.8 kg/m², indicating overweight. Men and women showed similar BMI values, with no statistically significant difference between groups (26.4 kg/m² vs. 25.3 kg/m², respectively; $p = 0.515$). **Conclusion:** Although the largest proportion of participants was classified as active, a considerable percentage of the population was sedentary during the period of COVID-19-related social restriction. In addition, the sample presented mean BMI values within the overweight range, without differences between men and women. These findings highlight the need for local public health strategies focused on increasing physical activity levels and preventing excess body weight, particularly during periods of social restriction.

**Keywords:** COVID-19; Health, Physical activity

## 1. Introduction

Regular physical exercise is widely recognized as an essential strategy for health promotion, disease prevention, and the management of several chronic conditions [1–3]. Its public health relevance is substantial, as regular physical activity has been estimated to prevent approximately four million deaths worldwide each year [4]. Accordingly, current recommendations indicate that adults should perform at least 150 minutes per week of low- to moderate-intensity physical activity, or 75 minutes per week of vigorous-intensity activity, combined with two weekly sessions of resistance exercise involving the major muscle groups [5,6].

Despite these well-established benefits, a large proportion of the global population remains insufficiently active. Physical inactivity has therefore been described as a pandemic in itself, being associated with more than five million deaths annually worldwide [7,8]. This scenario became even more concerning during the COVID-19 pandemic, when social distancing measures, home confinement, and restricted access to gyms, parks, sports facilities, and other exercise environments further reduced opportunities for regular physical activity [9].

Evidence from the pandemic period supports this concern. Goethals et al. [10] reported a 20% reduction in physical activity levels among older adults after the onset of the pandemic. Similarly, Pietrobelli et al. [11] observed that three weeks of lockdown were associated with increased consumption of high-calorie foods and reduced physical activity levels. These behavioral changes are relevant because, when maintained over time, they may contribute to adverse health outcomes related to sedentary behavior, excessive energy intake, weight gain, and metabolic dysfunction [12].

This issue is particularly important considering the close relationship between sedentary behavior, overweight, and obesity [13]. During the COVID-19 pandemic, obesity was also identified as an important risk factor for worse clinical outcomes. Studies have shown that individuals with obesity had more than twice the odds of hospitalization after SARS-CoV-2 infection, nearly four times the odds of requiring intensive care unit admission, and a higher risk of mortality [14–17]. Thus, monitoring physical activity and body composition during periods of social restriction is essential for understanding the potential medium- and long-term health consequences of the pandemic.

Although several studies have demonstrated the global impact of physical inactivity during COVID-19, local and regional data remain necessary. Municipal-level investigations are important because lifestyle patterns, access to exercise spaces, socioeconomic conditions, and public health responses may differ substantially across regions. In this context, the city of Itumbiara, located in the southern region of the state of Goiás, Brazil, on the border with Minas Gerais, represents an important setting for local epidemiological assessment. The municipality has an estimated population of 105,809 inhabitants and is the thirteenth most populous city in the state of Goiás [18].

Therefore, the main objective of the present study was to identify the physical activity level of the population of Itumbiara during the period of social restriction related to the COVID-19 pandemic. As a secondary objective, the study aimed to assess body composition using body mass index (BMI).

## 2. Methods

This study was designed as a descriptive cross-sectional study, reported in accordance with relevant recommendations from the STROBE statement for observational studies. Data collection was conducted between March and May 2021 in the municipality of Itumbiara, Goiás, Brazil.

### 2.1 Study design, setting, and participants

Participants were recruited using a non-probabilistic convenience sampling strategy. Eligible volunteers were adults aged 18 to 65 years who reported residing in the city of Itumbiara, Goiás. Individuals who did not meet the age criterion or who did not reside in the municipality were not considered eligible for participation. Sociodemographic and anthropometric characteristics of the eligible participants are presented in Table 1.

This study was conducted in accordance with the ethical principles established by Resolution No. 466/2012 of the Brazilian National Health Council, which regulates research involving human participants. Participants were informed about the objectives and procedures of the study before taking part in the research.

**Table 1**. Sociodemographic and anthropometric characteristics of the eligible participants

| Variable | Men | Women |
|---|---|---|
| Number of participants (N) | 101 | 114 |
| Age (mean ± SD), years | 36.33 ± 14.32 | 36.13 ± 14.45 |
| Height (mean ± SD), m | 1.75 ± 0.07 | 1.63 ± 0.07 |
| Total body mass (mean ± SD), kg | 80.99 ± 13.04 | 67.32 ± 11.68 |

### 2.2 Assessment of physical activity level

Physical activity level was assessed using the short version of the International Physical Activity Questionnaire (IPAQ). The IPAQ was used to classify participants according to their level of physical activity into the following categories: sedentary, irregularly active B, irregularly active A, active, and very active [19].

### 2.3 Assessment of body mass index

Body mass index (BMI) was assessed using a structured questionnaire. Body mass and height were self-reported by the participants and subsequently used to calculate BMI. BMI was expressed in kg/m² and used as an indicator of body composition.

### 2.4 Variables

The main outcome of the study was the physical activity level of the population of Itumbiara during the period of COVID-19-related social restriction. The secondary outcome was body mass index. Sex was considered as a grouping variable for comparative analysis of BMI.

### 2.5 Statistical analysis

Data are presented as mean ± standard deviation for continuous variables. The independent samples t-test was used to compare BMI values between men and women. All statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS), version 20.0. The level of statistical significance was set at $p \leq 0.05$.

## 3. Results

For the present study, 215 individuals of both sexes were invited to participate through convenience sampling, as shown in Figure 1.

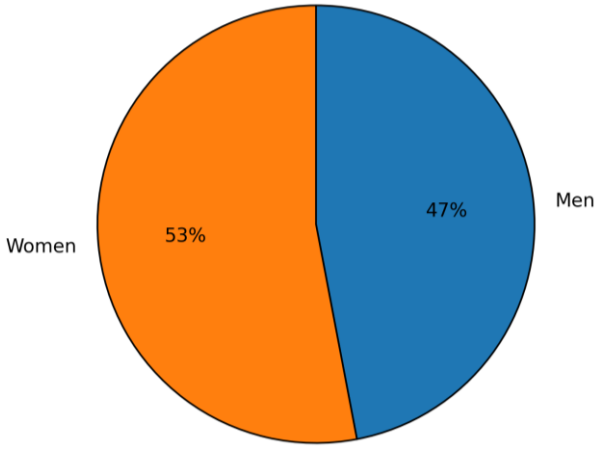


**Figure 1.** Distribution of men and women in the study.

Regarding physical activity level, participants were distributed across all IPAQ classification categories. Overall, 33% were classified as active, 24% as very active, 24% as irregularly active A, 7% as irregularly active B, and 26% as sedentary (Figure 2).

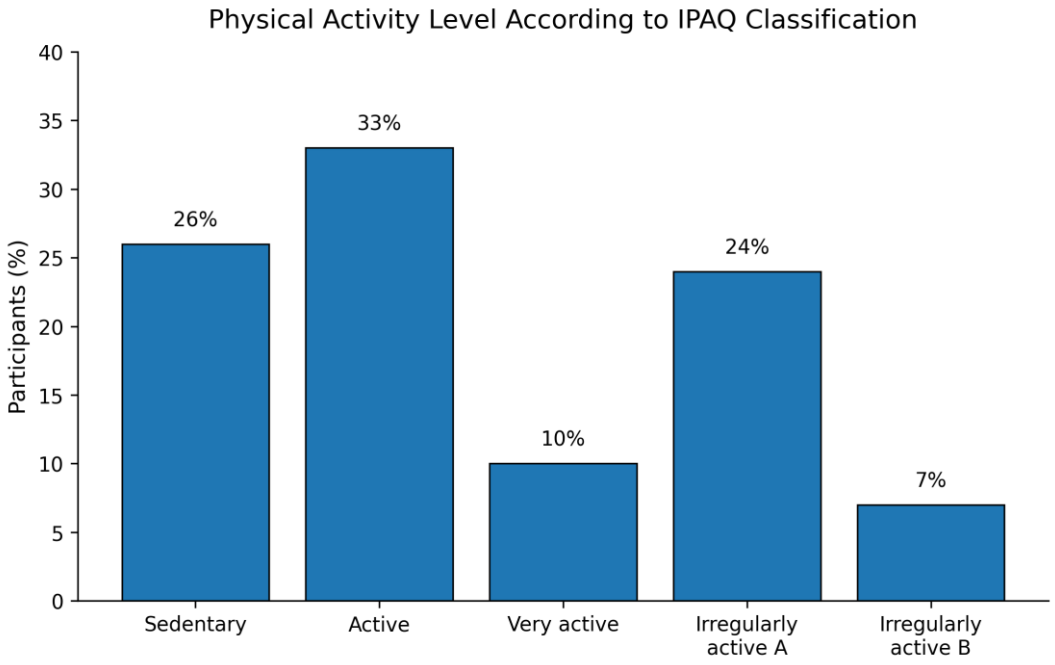


**Figure 2.** Frequency and distribution of physical activity levels among the study participants.

Furthermore, the overall mean BMI of the participants was classified as overweight (25.8 kg/m²). When BMI was compared between sexes, the results were similar, with no statistically significant difference ($p > 0.515$). Thus, both men and women were classified as overweight, with mean BMI values of 26.4 kg/m² and 25.3 kg/m², respectively, according to established recommendations [20] (Figure 3).

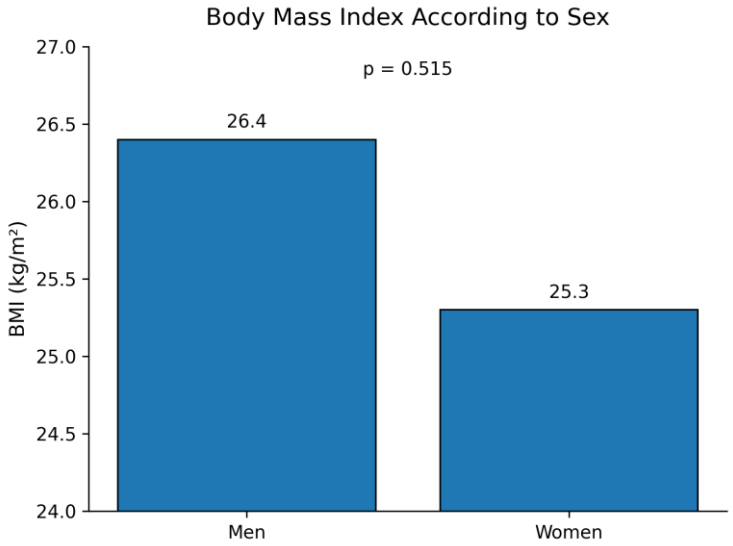


**Figure 3.** Comparison of body mass index between sexes in the study sample.

## 4. Discussion

The present study aimed to identify the physical activity level of the population of Itumbiara during the period of COVID-19-related social restriction. As a secondary objective, we assessed body mass index as an indicator of nutritional status. The main findings showed that, although the largest proportion of participants was classified as physically active, a considerable percentage of the sample was classified as sedentary. In addition, the overall mean BMI indicated overweight, with similar values between men and women.

The finding that a substantial proportion of participants was sedentary is relevant from a public health perspective. Even though active individuals represented an important part of the sample, the presence of a large sedentary subgroup suggests that social restriction may have affected the maintenance of regular physical activity in part of the population. This is concerning because physical inactivity is recognized as one of the leading modifiable risk factors for chronic diseases and premature mortality, being associated with approximately five million deaths annually worldwide [7,8].

These findings are consistent with previous evidence showing that insufficient physical activity is highly prevalent worldwide. Guthold et al. [5] reported that approximately one quarter of the global adult population does not meet the minimum physical activity recommendations for health. In Brazil, data from the Surveillance System for Risk and Protective Factors for Chronic Diseases by Telephone Survey (VIGITEL) indicated that 44.8% of the population is insufficiently active [21]. Therefore, although the present study was conducted in a municipal context, the results are aligned with broader national and international evidence indicating that physical inactivity remains an important public health problem.

The context in which the present study was conducted should also be considered. Data collection occurred during the COVID-19 pandemic, a period marked by social distancing, home confinement, and restricted access to gyms, parks, sports facilities, and other environments commonly used for physical activity. These restrictions may have contributed to reduced physical activity levels among part of the sample [9]. In this scenario, sedentary behavior is particularly relevant, as it has been associated with worse COVID-19-related outcomes, including higher risk of hospitalization, intensive care admission, and mortality [22].

Regarding the secondary objective, the mean BMI of the sample was classified as overweight. This pattern was observed in both men and women, with no statistically significant difference between sexes. This result suggests that excess body weight was a common characteristic of the investigated population, regardless of sex. Such finding is important because overweight and obesity are closely related to physical inactivity and sedentary behavior [13], and may contribute to increased cardiometabolic risk over time.

The BMI findings are also consistent with national and global trends. Projections indicate that, by 2030, more than two billion people worldwide may be classified as overweight and more than one billion as living with obesity [23]. In Brazil, approximately 58% of the population is already classified as overweight, and nearly 20% meets criteria for obesity [21]. Thus, the present findings reinforce the relevance of monitoring body mass indicators at the municipal level, particularly during periods in which lifestyle behaviors may be negatively affected.

Taken together, the results indicate that, although many participants from Itumbiara were classified as active, sedentary behavior and overweight were still highly relevant findings in the sample. These results support the need for local public health strategies aimed at promoting physical activity, reducing sedentary behavior, and preventing excessive weight gain, especially during periods of social restriction or reduced access to structured exercise environments.

This study has limitations that should be acknowledged. The use of convenience sampling limits the generalizability of the findings to the entire population of Itumbiara. In addition, body mass and height were self-reported, which

may have introduced measurement bias in BMI estimation. Finally, the cross-sectional design does not allow causal inferences regarding the effect of social restriction on physical activity level or BMI. Despite these limitations, the study provides relevant local evidence on physical activity and BMI during the COVID-19 pandemic period.

## 5. Conclusions

The present study showed that, during the period of COVID-19-related social restriction, the population of Itumbiara presented a heterogeneous physical activity profile. Although the largest proportion of participants was classified as active, a considerable percentage of the sample was sedentary, indicating that physical inactivity remained an important concern in this local context. In addition, the overall mean BMI was within the overweight range, with similar values between men and women. These findings suggest that, even in a sample with a relevant proportion of physically active individuals, excess body weight and sedentary behavior were still present. Therefore, local strategies aimed at promoting regular physical activity and preventing weight gain should be encouraged, particularly during periods of restricted access to exercise environments.

**Author Contributions:** Conceptualization, A.G.L.S., V.K.O.C., R.C.R., B.S.F.S., J.N.V.A.F., B.M.Z.G., M.P.R. and W.A.S.; methodology, A.G.L.S., V.K.O.C., R.C.R., B.S.F.S., J.N.V.A.F., B.M.Z.G. and M.P.R.; formal analysis, M.P.R. and W.A.S.; investigation, A.G.L.S., V.K.O.C., R.C.R., B.S.F.S., J.N.V.A.F. and B.M.Z.G.; data curation, A.G.L.S., V.K.O.C., R.C.R., B.S.F.S., J.N.V.A.F., B.M.Z.G. and M.P.R.; writing—original draft preparation, A.G.L.S., V.K.O.C., R.C.R., B.S.F.S., J.N.V.A.F. and B.M.Z.G.; writing—review and editing, M.P.R. and W.A.S.; visualization, M.P.R. and W.A.S.; supervision, M.P.R. and W.A.S.; project administration, M.P.R.; funding acquisition, not applicable. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research received no external funding.

**Institutional Review Board Statement:** The study was conducted in accordance with the Declaration of Helsinki, and approved by the Institutional Review Board of Instituto Luterano de Ensino Superior de Itumbiara – ILES/ULBRA for studies involving humans.

**Informed Consent Statement:** Informed consent was obtained from all subjects involved in the study.

**Conflicts of Interest:** The authors declare no conflicts of interest.

## References

1. Gremeaux V, Gayda M, Lepers R, Sosner P, Juneau M, Nigam A. Exercise and longevity. Maturitas. 2012;73(4):312–7.
2. Reiner M, Niermann C, Jekauc D, Woll A. Long-term health benefits of physical activity - A systematic review of longitudinal studies. BMC Public Health. 2013;13(1):1–9.
3. Pasanen T, Tolvanen S, Heinonen A, Kujala UM. Exercise therapy for functional capacity in chronic diseases: An overview of meta-analyses of randomised controlled trials. Br J Sports Med. 2017;51(20):1459–65.
4. Strain T, Brage S, Sharp SJ, Richards J, Tainio M, Ding D, et al. Use of the prevented fraction for the population to determine deaths averted by existing prevalence of physical activity: a descriptive study. Lancet Glob Heal [Internet]. 2020;8(7):e920–30.
5. Guthold R, Stevens GA, Riley LM, Bull FC. Worldwide trends in insufficient physical activity from 2001 to 2016: a pooled analysis of 358 population-based surveys with 1·9 million participants. Lancet Glob Heal [Internet]. 2018;6(10):e1077–86.
6. Garber CEBBMRDBAFMJLI-MLDCNDPS. Quantity and Quality of Exercise for Developing and Maintaining Neuromotor Fitness in Apparently Healthy Adults : Guidance for Prescribing Exercise. Am Coll Sport Med. 2011;1334–59.
7. Kohl HW, Craig CL, Lambert EV, Inoue S, Alkandari JR, Leetongin G, et al. The pandemic of physical inactivity: Global action for public health. Lancet [Internet]. 2012;380(9838):294–305.
8. Lee IM, Shiroma EJ, Lobelo F, Puska P, Blair SN, Katzmarzyk PT, et al. Effect of physical inactivity on major non-communicable diseases worldwide: An analysis of burden of disease and life expectancy. Lancet [Internet]. 2012;380(9838):219–29.
9. Honey-Rosés J, Anguelovski I, Chireh VK, Daher C, Konijnendijk van den Bosch C, Litt JS, et al. The impact of COVID-19 on public space: an early review of the emerging questions – design, perceptions and inequities. Cities Heal [Internet]. 2020;00(00):1–17.
10. Goethals L., Barth N., Guyot J., Hupin D., Celarier T. Need for a physical activity promotion strategy for older adults living at home during quarantine due to Covid-19. Jmir. 2020;4–11.
11. Pietrobelli A, Pecoraro L, Ferruzzi A, Heo M, Faith M, Zoller T, et al. Effects of COVID-19 Lockdown on Lifestyle Behaviors in Children with Obesity Living in Verona, Italy: A Longitudinal Study. Obesity. 2020;0–3.
12. Mattioli A V., Sciomer S, Cocchi C, Maffei S, Gallina S. "Quarantine during COVID-19 outbreak: Changes in diet and physical activity increase the risk of cardiovascular disease" [Internet]. Nutr Metab Cardiovasc Dis. 2020 Aug 28;30(9):1409-1417.
13. Gonçalves B, Silva C, Crochemore I, Silva M, Ekelund U, Brage S, et al. Associations of physical activity and sedentary time with body composition in Brazilian young adults. 2019;(September 2018):1–10.
14. Dietz W, Santos-Burgoa C. Obesity and its Implications for COVID-19 Mortality. Obesity. 2020;28(6):1005.
15. Jennifer Lighter MD, Michael Phillips2, 3, MD, Sarah Hochman2, 3, MD, Stephanie Sterling2, 3, MD, Diane Johnson2, 3, MD, Fritz Francois3, MD, Anna Stachel2, M. Obesity in patients younger than 60 years is a risk factor for Covid-19 hospital admission. Cancer [Internet]. 2020;46(May):1–17.
16. Carneiro RAVD, Hillesheim D, Hallal ALC. Correlation of overweight condition and obesity with mortality by COVID-19 in Brazil's state capitals. Arch Endocrinol Metab. 2021;(9):1–6.

17. Poly TN, Islam MM, Yang HC, Lin MC, Jian WS, Hsu MH, et al. Obesity and Mortality Among Patients Diagnosed With COVID-19: A Systematic Review and Meta-Analysis. Front Med. 2021;8(February):1–11.
18. Cidades e estados, Itumbiara. Instituto Brasileiro de Geografia e Estatística, 2021. Disponível em: https://www.ibge.gov.br/cidades-e-estados/go/itumbiara.html. Acesso em: 30, Junho de 2021.
19. Internacional Q. Questionário Internacional De Atividade Física (Ipaq): Estupo De Validade E Reprodutibilidade No Brasil. Quest Int Atividade Física Estupo Validade E Reprodutibilidade No Bras. 2012;6(2):5–18.
20. WORLD HEALTH ORGANIZATION. Obesity: preventing and managing the global epidemic. Report of a World Health Organization Consultation. Geneva: World Health Organization, p.253, 2000.
21. Ministério da Saúde. Vigitel Brasil 2019 [Internet]. Vigitel Brasil 2019: vigilância de fatores de risco e proteção para doenças crônicas por inquérito telefônico: estimativas sobre frequência e distribuição sociodemográfica de fatores de risco e proteção para doenças crônicas nas capitais dos 26 estados. 2020. 139 p.
22. Sallis R, Young DR, Tartof SY, Sallis JF, Sall J, Li Q, et al. Physical inactivity is associated with a higher risk for severe COVID-19 outcomes: A study in 48 440 adult patients. Br J Sports Med. 2021;(March 2020):1–8.
23. Kelly T, Yang W, Chen CS, Reynolds K, He J. Global burden of obesity in 2005 and projections to 2030. Int J Obes. 2008;32(9):1431–7.
24. Ribeiro de Souza F, Motta-Santos D, dos Santos Soares D, Beust de Lima J, Gonçalves Cardozo G, Santos Pinto Guimarães L, et al. Physical Activity Decreases the Prevalence of COVID-19-associated Hospitalization: Brazil EXTRA Study. 2020.