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# Prevalence of Obesity and Associated Factors in a Brazilian Municipality: A Population-Based Cross-Sectional Study

# Prevalência de Obesidade e Fatores Associados em um Município Brasileiro: Estudo Transversal de Base Populacional

# Prevalencia de Obesidad y Factores Asociados en un Municipio Brasileño: Estudio Transversal de Base Poblacional

Patrícia Silva Bazoni[1], Ronaldo José Faria[2] Jéssica Barreto Ribeiro dos Santos[3], Michael Ruberson Ribeiro da Silva[4]

[1234] Universidade Federal do Espírito Santo, Vitória, Espírito Santo, Brasil.

**Autor correspondente:**
Nome Patrícia Silva Bazoni
E-mail: patricia.bazoni@yahoo.com.br

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## ABSTRACT

This study aimed to identify the prevalence of obesity and associated factors among residents of a municipality in southern Espírito Santo, Brazil. A cross-sectional epidemiological study was conducted through a household survey in the municipality of Alegre between November and December 2021. Descriptive analysis included frequency distributions for categorical variables and calculation of means and standard deviations for continuous variables. Factors associated with obesity were investigated using Poisson regression with robust variance. A total of 645 individuals were interviewed. Based on self-reported weight and height, the prevalence of

obesity was 27.6%. Factors associated with obesity included age below 60 years, female sex, self-reported Black race/skin color, better self-rated health, not being vaccinated against COVID-19, and self-reported hypertension and diabetes *mellitus*. The prevalence of obesity was high in the studied population. These findings contribute to the identification of groups more vulnerable to obesity and may support the development of prevention, health promotion, and disease management strategies aimed at reducing the burden of obesity and its associated comorbidities.
**Keywords:** Obesity; Epidemiology; Risk factors; Health surveys; COVID-19.

## RESUMO

Este estudo teve como objetivo identificar a prevalência de obesidade e os fatores associados entre residentes de um município do sul do Espírito Santo, Brasil. Foi realizado um estudo epidemiológico transversal por meio de inquérito domiciliar no município de Alegre entre novembro e dezembro de 2021. A análise descritiva incluiu distribuições de frequência para variáveis categóricas e cálculo de médias e desvios-padrão para variáveis contínuas. Os fatores associados à obesidade foram investigados por meio de regressão de Poisson com variância robusta. Foram entrevistados 645 indivíduos. Com base no peso e na altura autorreferidos, a prevalência de obesidade foi de 27,6%. Os fatores associados à obesidade incluíram idade inferior a 60 anos, sexo feminino, raça/cor da pele preta autorreferida, melhor autopercepção do estado de saúde, não vacinação contra a COVID-19 e relato de hipertensão arterial e diabetes *mellitus*. A prevalência de obesidade foi elevada na população estudada. Esses achados contribuem para a identificação de grupos mais vulneráveis à obesidade e podem subsidiar o desenvolvimento de estratégias de prevenção, promoção da saúde e manejo de doenças voltadas à redução da carga da obesidade e de suas comorbidades associadas.
**Palavras-chave:** Obesidade; Epidemiologia; Fatores de risco; Inquéritos de saúde; COVID-19.

## RESUMEN

Este estudio tuvo como objetivo identificar la prevalencia de obesidad y los factores asociados entre los residentes de un municipio del sur del estado de Espírito Santo, Brasil. Se realizó un estudio epidemiológico transversal mediante una encuesta domiciliaria en el municipio de Alegre entre noviembre y diciembre de 2021. El análisis descriptivo incluyó distribuciones de frecuencia para variables categóricas y el cálculo de medias y desviaciones estándar para variables continuas. Los factores asociados con la obesidad fueron investigados mediante regresión de Poisson con varianza robusta. Se entrevistó a un total de 645 individuos. Con base en el peso y la talla autorreportados, la prevalencia de obesidad fue del 27,6 %. Los factores asociados con la obesidad incluyeron edad menor de 60 años, sexo femenino, raza/color de piel negra autorreportada, mejor autopercepción del estado de salud, no estar vacunado contra la COVID-19 y autorreporte de hipertensión arterial y diabetes *mellitus*. La prevalencia de obesidad fue elevada en la población estudiada. Estos hallazgos contribuyen a la identificación de grupos más vulnerables a la obesidad y pueden apoyar el desarrollo de estrategias de prevención, promoción de la salud y manejo de enfermedades orientadas a reducir la carga de la obesidad y sus comorbilidades asociadas.
**Palabras clave:** Obesidad; Epidemiología; Factores de riesgo; Encuestas de salud; COVID-19.

## INTRODUCTION

Obesity is a complex, multifactorial condition characterized by excessive accumulation of body fat that impairs health (World Health Organization, 2025). It has a high prevalence and is considered a global epidemic. Furthermore, it is associated with various Noncommunicable Chronic Diseases (NCDs), such as: systemic arterial hypertension (SAH), cardiovascular diseases (CVD), type 2 diabetes *mellitus* (T2DM), and certain types of cancer (Mainardes et al., 2023; Chong et al., 2023).

According to the World Obesity Atlas 2023, the prevalence of obesity is expected to increase substantially worldwide over the coming years. It is estimated that approximately one in seven people worldwide were living with obesity in 2020, whereas projections indicate that nearly one in four people—almost 2 billion individuals—will be living with obesity by 2035. If effective measures are not implemented, the economic impact of overweight and obesity is projected to reach US$4.32 trillion annually by 2035, representing approximately 3% of the global gross domestic product (GDP) (World Obesity Federation, 2023).

In Brazil, obesity has also increased substantially in recent decades. Using data from the Telephone-Based Surveillance System for Risk and Protective Factors for Chronic Diseases (VIGITEL), Silva et al. (2021) reported that the prevalence of obesity increased from 11.8% in 2006 to 20.3% in 2019, highlighting the growing burden of this condition in the Brazilian population.

There are several ways to measure obesity, with the Body Mass Index (BMI) being the most widely used parameter for assessing nutritional status in adults. According to the World Health Organization (WHO), BMI is calculated by dividing an individual's weight by the square of their height, with values ≥25 kg/m$^2$ indicating overweight and values ≥30 kg/m$^2$ indicating obesity (Ferreira et al., 2019; World Health Organization, 2025).

The causes of obesity are primarily related to lifestyle, including dietary and physical activity patterns, as well as environmental factors such as access to healthcare, and political, sociocultural, educational, and economic issues that influence the environment in which people live (Dias et al., 2017; Malta et al., 2017). Identifying factors associated with obesity and understanding their distribution in the population are important for recognizing vulnerable groups and supporting the development of prevention and control strategies (Canuto et al., 2022).

In this context, health surveys are extremely valuable, as they provide an up-to-date description of the health profile and the distribution of risk factors in the studied population, taking into account the specific characteristics of the geographic region (Malta et al., 2008). Given the above, the present study aimed to identify the prevalence and factors associated with obesity among residents of the municipality of Alegre, in the southern region of Espírito Santo.

## METHODOLOGY

### Study Design and Setting

A cross-sectional epidemiological study was conducted through a household survey in the municipality of Alegre, Espírito Santo, during November and December 2021. The city is located in the southern region of the state, with an estimated population of 29,177 inhabitants in 2022, distributed between the municipal seat and the districts of Anutiba, Araraí, Café, Celina, Rive, Santa Angélica, and São João do Norte (Brazilian Institute of Geography and Statistics, 2022). The study population consisted of residents aged 18 years or older from the urban area of the municipality, including both the municipal seat and districts, who agreed to participate by signing the Informed Consent Form (ICF). According to the 2010 census, the urban

population of Alegre was 21,512 inhabitants, of whom 16,179 lived in the municipal seat (Brazilian Institute of Geography and Statistics, 2010).

## Sample Size and Sampling Procedure

The sample size was calculated using the municipality's urban population as a reference, considering a 95% confidence level ($\alpha = 0.05$), an estimated prevalence of 50% for different study outcomes, and a design effect of 1.5. Under these assumptions, the minimum required sample size was estimated at 567 individuals. An additional 10% was included to compensate for potential losses, resulting in a final sample of 624 individuals (Charan & Biswas, 2013).

Participant selection followed the Probability Proportional to Size (PPS) sampling method, as recommended by the World Health Organization (WHO) and the U.S. Centers for Disease Control and Prevention (World Health Organization, 2004; Centers for Disease Control and Prevention, 2022). In the first stage, 10 out of the 37 urban census tracts of Alegre were randomly selected. In the second stage, an equal number of individuals was interviewed in each tract.

## Data Collection

Data collection was conducted using a structured and pre-coded questionnaire containing questions organized into thematic sections, including sociodemographic information, general health status, COVID-19-related issues, use of health services, use of medications and medicinal plants, lifestyle habits, and quality of life assessment through the European Quality of Life 5 Dimensions 3 Levels (EQ-5D-3L) questionnaire. Developed by the EuroQol research group, this instrument is widely recognized and frequently used to assess health-related quality of life worldwide (Reenen et al., 2018).

Before data collection, researchers underwent practical training on the questionnaire and fieldwork procedures, and a pilot study was conducted to test and evaluate the instrument. To minimize researchers' exposure during the COVID-19 pandemic, safety protocols were adopted, including frequent hand sanitization, use of face masks, and personal protective equipment (PPE).

## Study Variables

The dependent variable was obesity, determined using Body Mass Index (BMI), calculated by dividing weight in kilograms by height in meters squared. Weight and height were self-reported by participants through the questions: "Do you know your weight (even if approximate)?" and "Do you know your height?" Participants were classified as underweight (BMI ≤18.5 kg/m$^2$), normal weight (BMI 18.6–24.9 kg/m$^2$), overweight (BMI 25.0–29.9 kg/m$^2$), or obese (BMI ≥30.0 kg/m$^2$) (Brazil, 2020).

Independent variables included age group, sex, race, region of residence, marital status, religion, education level, income, self-perceived health, quality of life, medical, dental, and nutritionist visits in the previous year, private health insurance, regular physical activity, alcohol consumption, smoking, daily hours of sleep, self-medication, polypharmacy, problems with adherence to pharmacotherapy, use of medicinal plants, and comorbidities.

## Statistical Analysis

Descriptive statistics were used to summarize the study variables. Categorical variables were described as absolute and relative frequencies, whereas continuous variables were

described as means and standard deviations. In the bivariate analysis, categorical variables were compared using the chi-square test, and continuous variables were compared using Student's t-test. Factors associated with obesity were assessed using Poisson regression with robust variance in both bivariate and multivariate analyses. Variables with $p \leq 0.20$ in the bivariate analysis were included in the multivariate model, and variables with $p \leq 0.05$ were retained in the final model. Data analysis was performed using Jamovi software, version 2.2.5, except for Poisson regression, which was conducted using Stata, version 16.1.

### Ethical Considerations

This study was approved by the Research Ethics Committee of the Federal University of Espírito Santo (UFES) under approval number 4,732,878. The informed consent form was approved and signed by all participants. All procedures followed the ethical standards established by the human research committee and the principles of the 1964 Declaration of Helsinki, revised in 2013 (World Medical Association, 2013).

## RESULTS

A total of 645 individuals were interviewed; among those with obesity, the mean age was 51.8 years (SD = 17.2), with a mean weight in kilograms (kg) of 87.6 (SD = 13.0), average height in meters of 1.61 (SD = 0.08), and an average BMI of 34.1 (SD = 4.57). The prevalence of obesity was higher among females (31.0%) and among those who reported being of a race or color other than white or brown (37.4%) (Table 1).

**Table 1.** Sociodemographic characteristics of the study population in Alegre, Espírito Santo, Brazil, 2021.

| Variables | Obesity (n = 178) | No Obesity (n = 467) | *p*-Value |
|---|---|---|---|
| ***Age in years (mean, SD)*** | 51.8 (17.2) | 53.1 (19,6) | 0.416 |
| ***Weight in kg (mean, SD)*** | 87.6 (13.0) | 65.3 (10.6) | <0.001* |
| ***Height in meters (mean, SD)*** | 1.61 (0.08) | 1.63 (0.09) | <0.001* |
| ***BMI (mean, SD)*** | 34.1 (4.57) | 24.4 (3.19) | <0.001* |
| ***Gender*** | | | 0.002* |
| Women (n, %) | 143 (31.0) | 319 (69.0) | |
| Men (n, %) | 35 (19.1) | 148 (80.9) | |
| ***Skin color*** | | | 0.004* |
| White (n, %) | 69 (22.1) | 243 (77.9) | |
| Mixed-race (n, %) | 66 (30.6) | 150 (69.4) | |
| Black/other (n, %) | 43 (37.4) | 72 (62.6) | |
| ***Region of residence*** | | | 0.480 |
| Municipal seat (n, %) | 126 (28.3) | 319 (71.7) | |
| District (n, %) | 51 (25.6) | 148 (74.4) | |
| ***Marital status*** | | | 0.199 |
| Single (n, %) | 49 (28.0) | 126 (72.0) | |
| Married (n, %) | 85 (30.6) | 193 (69.4) | |
| Other (n, %) | 44 (23.1) | 147 (76.9) | |
| ***Religion*** | | | 0.393 |
| No religion (n, %) | 11 (22.0) | 39 (78.0) | |
| Catholic (n, %) | 83 (25.6) | 241 (74.4) | |

| | | | |
|---|---|---|---|
| Protestant (n, %) | 72 (30.9) | 161 (69.1) | |
| Other (n, %) | 12 (31.6) | 26 (68.4) | |
| ***Educational level*** | | | 0.456 |
| Incomplete elementary education or lower (n, %) | 62 (26.7) | 170 (73.3) | |
| Completed high school education (n, %) | 96 (29.4) | 230 (70.6) | |
| Technical or higher education (n, %) | 20 (23.0) | 67 (77.0) | |
| ***Per capita income*** | | | 0.171 |
| Up to 1 minimum wage (n, %) | 82 (30.0) | 191 (70.0) | |
| From 1 to 2 minimum wages (n, %) | 72 (26.9) | 196 (73.1) | |
| More than 2 minimum wages (n, %) | 13 (17.8) | 56 (81.2) | |

**Source:** Authors' own elaboration.
SD: Standard deviation; BMI: Body Mass Index n: number of respondents for each variable in relation to the total number of respondents; %: percentage of the variable in relation to the total number of respondents; *Statistically significant (p-value < 0.05).

An average quality of life of 0.862 (SD = 0.150) was observed among individuals with obesity; furthermore, 29.3% of participants rated their health status as fair. It was observed that 27.6% had visited a doctor, 27.0% had visited a dentist, and 37.3% had consulted a nutritionist in the past year. Approximately 22.0% had private health insurance, 25.3% engaged in regular physical activity, 28.7% reported consuming alcoholic beverages, 29.4% were smokers, 31.8% slept less than 6 hours per day, 34.2% had COVID-19, and 26.9% had been vaccinated against COVID-19. A higher prevalence of obesity was also observed among participants who self-medicated (29.3%) and among those on multiple medications (29.0%). About 24.0% reported problems adhering to pharmacotherapy, and 29.6% used herbal remedies (Table 2).

**Table 2.** Clinical and health characteristics of the study population in Alegre, Espírito Santo, Brazil, 2021.

| **Variables** | **Obesity** (n = 178) | **No Obesity** (n = 467) | ***p*-Value** |
|---|---|---|---|
| ***Quality of life (mean, SD)*** | 0.862 (0.150) | 0.860 (0.182) | 0.913 |
| ***Self-perceived health*** | | | 0.115 |
| Very good/good (n, %) | 94 (18.1) | 240 (71.9) | |
| Regular (n, %) | 76 (29.3) | 183 (70.7) | |
| Bad/very bad (n, %) | 8 (15.4) | 44 (84.6) | |
| ***Medical consultations in the last year*** | | | 0.988 |
| Yes (n, %) | 142 (27.6) | 372 (72.4) | |
| No (n, %) | 36 (21.7) | 94 (78.3) | |
| ***Dental consultations in the last year*** | | | 0.786 |
| Yes (n, %) | 68 (27.0) | 184 (73.0) | |
| No (n, %) | 106 (28.0) | 273 (72.0) | |
| ***Consultations with a nutritionist in the last year*** | | | 0.081 |
| Yes (n, %) | 22 (37.3) | 37 (62.7) | |
| No (n, %) | 149 (25.6) | 411 (73.4) | |

| | | | |
|---|---|---|---|
| ***Private health insurance plan*** | | | 0.111 |
| Yes (n, %) | 34 (22.5) | 117 (77.5) | |
| No (n, %) | 144 (29.1) | 350 (70.9) | |
| ***Regularly performs physical activity*** | | | 0.362 |
| Yes (n, %) | 58 (25.3) | 171 (74.7) | |
| No (n, %) | 119 (28.7) | 296 (71.3) | |
| ***Consumption of alcoholic beverages*** | | | 0.689 |
| Yes (n, %) | 49 (28.7) | 122 (71.3) | |
| No (n, %) | 128 (27.1) | 345 (72.9) | |
| ***Smoker*** | | | 0.669 |
| Yes (n, %) | 25 (29.4) | 60 (70.6) | |
| No (n, %) | 152 (27.2) | 407 (72.8) | |
| ***Hours of daily sleep*** | | | 0.384 |
| <6 h (n, %) | 49 (31.8) | 105 (68.2) | |
| From 6 to 7 h (n, %) | 45 (26.7) | 130 (74.3) | |
| From 7 to 8 h (n, %) | 59 (28.4) | 149 (71.6) | |
| >8 h (n, %) | 24 (22.6) | 82 (77.4) | |
| ***History of COVID-19 infection*** | | | 0.058 |
| Yes (n, %) | 41 (34.2) | 79 (65.8) | |
| No (n, %) | 133 (25.6) | 386 (74.4) | |
| ***COVID-19 vaccination status*** | | | 0.010* |
| Yes (n, %) | 169 (26.9) | 459 (73.1) | |
| No (n, %) | 9 (56.3) | 7 (43.7) | |
| **Self-Medication** | | | 0.209 |
| Yes (n, %) | 126 (29.3) | 304 (70.7) | |
| No (n, %) | 44 (24.3) | 137 (75.7) | |
| ***Medications in use*** | | | 0.662 |
| Without polypharmacy (< 5 medications) (n, %) | 139 (27.1) | 374 (72.9) | |
| Polypharmacy (≥ 5 medications) (n, %) | 38 (29.0) | 93 (71.0) | |
| ***Treatment adhering problem*** | | | 0.244 |
| Yes (n, %) | 38 (24.2) | 119 (75.8) | |
| No (n, %) | 129 (29.1) | 315 (70.9) | |
| ***Use of medicinal plants*** | | | 0.346 |
| Yes (n, %) | 74 (29.6) | 176 (70.4) | |
| No (n, %) | 100 (26.2) | 282 (73.8) | |

**Source:** Authors' own elaboration.
SD: Standard deviation; n: number of participants for each variable relative to the total number of participants; %: percentage of each variable relative to the total number of participants; *Statistically significant (p-value < 0.05).

The average number of daily meals among obese respondents was 4.09 (SD = 1.03) meals, while among non-obese individuals it was 4.23 (SD = 1.02) meals. In the obese group, 27.6% ate breakfast, 27.2% had a snack between breakfast and lunch, 100.0% ate lunch, 26.6% had an afternoon snack or tea, 25.6% ate dinner, and 25.9% had a snack before bed (evening snack). There was no difference in the frequency of meals consumed per day between the groups (Table 3).

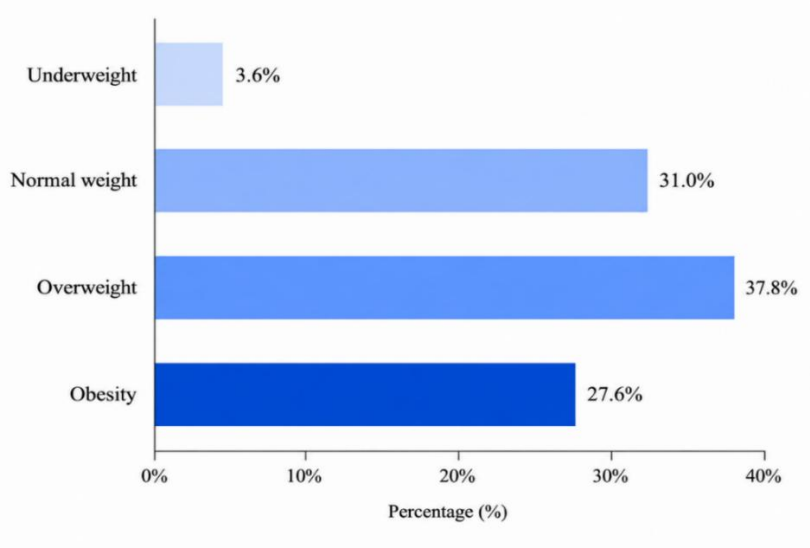
**Table 3.** Daily meals consumed by study participants in Alegre, Espírito Santo, Brazil, 2021.

| Variables | Obesity (n = 178) | No Obesity (n = 467) | *p*-Value |
|---|---|---|---|
| ***Daily meals (mean, SD)*** | 4.09 (1.03) | 4.23 (1.02) | 0.600 |
| ***Breakfast*** | | | 0.947 |
| Yes (n, %) | 164 (27.6) | 431 (72.4) | |
| No (n, %) | 14 (28.0) | 36 (72.0) | |
| ***Morning snack*** | | | 0.813 |
| Yes (n, %) | 82 (27.2) | 220 (72.8) | |
| No (n, %) | 96 (28.0) | 247 (72.0) | |
| ***Lunch*** | | | 0.166 |
| Yes (n, %) | 178 (27.8) | 462 (72.2) | |
| No (n, %) | 0 (0.0) | 5 (100.0) | |
| ***Afternoon snack or afternoon coffee*** | | | 0.323 |
| Yes (n, %) | 129 (26.6) | 356 (73.4) | |
| No (n, %) | 49 (30.6) | 111 (69.4) | |
| ***Dinner or evening coffee*** | | | 0.072 |
| Yes (n, %) | 118 (25.6) | 343 (74.4) | |
| No (n, %) | 60 (32.6) | 124 (67.4) | |
| ***Late-night snack*** | | | 0.479 |
| Yes (n, %) | 57 (25.9) | 163 (74.1) | |
| No (n, %) | 121 (28.5) | 303 (71.5) | |

**Source:** Authors' own elaboration.
n: number of participants for each variable relative to the total number of participants; %: percentage of each variable relative to the total number of participants.

Based on the weight in kilograms and height in meters reported by each respondent, it was possible to calculate the BMI of each participant, revealing an obesity prevalence of 27.6% (n = 178). In addition, it was observed that 23 (3.6%) were underweight, 200 (31.0%) were at ideal weight, and 244 (37.8%) were overweight (Figure 1).

**Figure 1.** BMI classification categories in the study sample.




**Source:** Authors' own elaboration.
BMI: Body Mass Index.

Regarding the presence of comorbidities, this was more common among participants with obesity, with 36.2% reporting more than two conditions. Among the main comorbidities associated with obesity are: diabetes *mellitus* (39.3%), hypertension (34.4%), anxiety (30.7%), depression (29.9%), and dyslipidemia (26.4%) (Table 4).

**Table 4.** Main self-reported comorbidities among study participants in Alegre, Espírito Santo, Brazil, 2021.

| Variables | Obesity (n = 178) | No Obesity (n = 467) | *p*-Value |
|---|---|---|---|
| ***Number of diseases*** | | | < 0.001* |
| Up to 2 diseases (n, %) | 71 (20.3) | 278 (79.7) | |
| More than 2 diseases (n, %) | 107 (36.2) | 189 (63.8) | |
| ***Main comorbidities*** | | | |
| Hypertension (n, %) | 101 (34.4) | 193 (65.6) | < 0.001* |
| Anxiety (n, %) | 91 (30.7) | 205 (69.3) | 0.100 |
| Dyslipidemia (n, %) | 42 (26.4) | 117 (73.6) | 0.701 |
| Depression (n, %) | 38 (29.9) | 89 (70.1) | 0.513 |
| Diabetes *mellitus* (n, %) | 35 (39.3) | 54 (60.7) | 0.008* |
| Gastroesophageal reflux disease (n, %) | 28 (31.1) | 62 (68.9) | 0.421 |
| Rheumatoid arthritis (n, %) | 25 (24.8) | 76 (75.2) | 0.486 |
| Kidney diseases (n, %) | 24 (34.8) | 45 (65.2) | 0.158 |

| | | | |
|---|---|---|---|
| Hypothyroidism (n, %) | 17 (34.7) | 32 (65.3) | 0.240 |
| Asthma (n, %) | 16 (37.2) | 27 (62.8) | 0.144 |
| Heart diseases (n, %) | 15 (22.7) | 51 (77.3) | 0.346 |
| Cancer/tumor/neoplasm (n, %) | 5 (25.0) | 15 (75.0) | 0.792 |

**Source:** Authors' own elaboration.
n: number of participants for each variable relative to the total number of participants; %: percentage of each variable relative to the total number of participants; *Statistically significant (p-value < 0.05).

In the multivariate analysis, younger age, female gender, self-reported Black race/skin color, better self-perceived health, lack of COVID-19 vaccination, and diagnoses of hypertension and diabetes *mellitus* remained independently associated with obesity (Table 5).

Adults younger than 60 years presented a 10% higher prevalence of obesity compared with older adults aged 60 years or over (PR = 1.10; 95% CI: 1.03–1.16). Similarly, women showed a 9% higher prevalence of obesity than men (PR = 1.09; 95% CI: 1.03–1.15). Regarding race/skin color, individuals who self-identified as Black had an 11% higher prevalence of obesity compared with those who self-identified as White (PR = 1.11; 95% CI: 1.03–1.20) (Table 5).

Participants who rated their health as regular (PR = 1.12; 95% CI: 1.02–1.23) or good/very good (PR = 1.14; 95% CI: 1.04–1.25) had a higher prevalence of obesity compared with those who rated their health as poor/very poor. In addition, individuals who had not been vaccinated against COVID-19 showed a 23% higher prevalence of obesity than vaccinated individuals (PR = 1.23; 95% CI: 1.07–1.42). The presence of hypertension (PR = 1.14; 95% CI: 1.07–1.20) and diabetes *mellitus* (PR = 1.11; 95% CI: 1.02–1.20) was also associated with a higher prevalence of obesity in the study population (Table 5).

**Table 5.** Multivariate analysis of factors associated with obesity among study participants in Alegre, Espírito Santo, Brazil, 2021.

| Variables | PR | CI 95% | *p*-Value |
|---|---|---|---|
| ***Age group*** | | | |
| ≥ 60 years | 1.00 | | |
| < 60 years | 1.10 | 1.03 – 1.16 | 0.002 |
| ***Gender*** | | | |
| Men | 1.00 | | |
| Women | 1.09 | 1.03 – 1.15 | 0.004 |
| ***Skin color*** | | | |
| White | 1.00 | | |
| Mixed-race | 1.06 | 1.00 – 1.12 | 0.061* |
| Black | 1.11 | 1.03 – 1.20 | 0.005 |
| ***Self-perceived health*** | | | |
| Bad/very bad | 1.00 | | |
| Regular | 1.12 | 1.02 – 1.23 | 0.016 |
| Very good/good | 1.14 | 1.04 – 1.25 | 0.005 |
| ***COVID-19 vaccination status*** | | | |
| Yes | 1.00 | | |
| No | 1.23 | 1.07 – 1.42 | 0.004 |
| ***Hypertension*** | | | |
| No | 1.00 | | |
| Yes | 1.14 | 1.07 – 1.20 | <0.001 |

| | | | |
|---|---|---|---|
| ***Diabetes mellitus*** | | | |
| No | 1.00 | | |
| Yes | 1.11 | 1.02 – 1.20 | 0.012 |

**Source:** Authors' own elaboration.
PR: Prevalence ratio; CI: Confidence interval. *Not statistically significant (p-value > 0.05).

## DISCUSSION

The present study identified a high prevalence of obesity in the study population. This finding is consistent with evidence showing increasing obesity prevalence both in Brazil and worldwide (Ferreira et al., 2019; Silva et al., 2021; World Obesity Federation, 2023). The growing burden of obesity represents a major public health challenge due to its association with several chronic non-communicable diseases, particularly hypertension and diabetes *mellitus*, as well as its impact on quality of life and healthcare expenditures (Chong et al., 2023; World Obesity Federation, 2023).

This scenario reflects the nutritional transition observed in Brazil, characterized by a decline in undernutrition and a concomitant increase in overweight and obesity (Santos et al., 2019; Martins et al., 2021). Martins et al. (2021) emphasized that changes in dietary patterns and lifestyle among the Brazilian population have contributed to this process, favoring the increase in obesity over recent decades.

Furthermore, Mainardes et al. (2023) reported higher obesity prevalence in the most industrialized regions of Brazil, particularly in the Southeast and South. Although the present study was not designed to investigate the determinants of these regional differences, this pattern may be associated with the social, economic, and behavioral changes that have accompanied urbanization and the nutritional transition observed in the country (Santos et al., 2019; Martins et al., 2021).

Analyses based on VIGITEL data have shown a high prevalence of risk factors for chronic diseases among Brazilian adults, including low consumption of fruits and vegetables, insufficient leisure-time physical activity, and frequent consumption of soft drinks and high-fat foods (Iser et al., 2012). Similarly, Nascimento et al. (2017) reported a high prevalence of excess weight among employees of a private company in Cuiabá and observed frequent consumption of fried foods, sugary foods, processed products, and alcoholic beverages, dietary habits that may contribute to weight gain.

Regarding the factors associated with obesity identified in the present study, younger individuals (< 60 years) showed a higher prevalence of obesity. Similar findings were reported by Loureiro et al. (2020) and Ferreira et al. (2019), who identified higher obesity prevalence among middle-aged adults, with lower prevalence observed in older age groups. This pattern may be associated with changes occurring during Brazil's nutritional transition, characterized by the progressive increase in obesity and the high frequency of risk behaviors for chronic diseases among the adult population (Iser et al., 2012; Martins et al., 2021).

The results of this study showed that women had a higher prevalence of obesity. Similar findings have been reported in previous studies. Santos et al. (2020) found that women were more likely to be obese than men among Quilombola adults in Bahia. This finding may be explained by a combination of biological and sociocultural factors. Hormonal changes occurring throughout the female life course, including reproductive transitions, may influence body weight regulation, while socioeconomic and reproductive factors have also been associated with obesity among women (Koceva et al., 2024; Santana et al., 2025).

Regarding race/skin color, participants who self-identified as Black had a higher prevalence of obesity. Similar findings have been reported in both national and international studies. In Brazil, Machado et al. (2021) identified a higher incidence of obesity among Black individuals compared with White individuals, while Rodrigues et al. (2024) found an

association between obesity and Black or Brown skin color among Brazilian adults. Likewise, studies conducted in the United States have reported a higher occurrence of obesity among Black populations, particularly among women (Lofton et al., 2023; Frisco et al., 2025).

The mechanisms underlying this association are multifactorial. Evidence suggests that racial discrimination, socioeconomic inequalities, unequal access to healthy foods, opportunities for physical activity, and access to healthcare services may contribute to the racial disparities observed in obesity (Machado et al., 2021; Lofton et al., 2023). In addition, cumulative socioeconomic disadvantages throughout the life course have been identified as factors that may explain part of the higher prevalence of obesity among Black individuals (Frisco et al., 2025).

Individuals who rated their health as fair, good, or very good showed a higher prevalence of obesity in this study. This finding differs from that reported by Ferreira et al. (2021), who identified a higher prevalence of obesity among individuals with poorer self-rated health. One possible explanation for this result is that individuals with excess weight often fail to recognize their condition or tend to underestimate it (Robinson, 2017; Robinson et al., 2020).

In this context, the growing social normalization of obesity may reduce the perception of excess weight as a health problem. As larger body sizes become increasingly common within the population, individuals with obesity may report more favorable assessments of their own health, even in the presence of this condition (Robinson, 2017; Robinson et al., 2020).

Individuals who had not been vaccinated against COVID-19 showed a higher prevalence of obesity in the present study. Although lack of COVID-19 vaccination was associated with obesity, this finding should be interpreted with caution due to the cross-sectional design and the small number of unvaccinated participants. Nevertheless, this finding deserves attention, as obesity has been consistently associated with an increased risk of severe COVID-19 outcomes, including hospitalization and mortality (Gonçalves et al., 2021). In addition, studies conducted among individuals with obesity have reported high levels of vaccine hesitancy, characterized by low confidence in vaccines, concerns about adverse effects, and doubts regarding their effectiveness (Vallis & Glazer, 2021; Kizilkaya et al., 2022).

The results of this study showed that hypertension and diabetes *mellitus* were significantly associated with obesity, corroborating findings from previous studies (Ferreira et al., 2021; Silveira et al., 2018). These findings reinforce the well-established relationship between obesity and the development of chronic non-communicable diseases. According to Global Burden of Disease estimates, high BMI accounted for 13% of all deaths in Brazil in 2017, with cardiovascular diseases and diabetes representing the leading causes of death attributable to this risk factor (Felisbino-Mendes et al., 2020).

One of the main limitations of the study was the use of self-reported data. This type of data may not accurately reflect reality due to potential perceptual bias on the part of the participant, such as the tendency to overestimate height and underestimate one's own weight. This may result in an underestimation of BMI and, consequently, in underestimated prevalences of overweight.

Despite these limitations, the study has important strengths. The population-based household design increased the representativeness of the findings, while the evaluation of multiple sociodemographic and health-related factors provided a comprehensive assessment of variables associated with obesity. Furthermore, data collection during the COVID-19 pandemic offers relevant evidence on obesity and its associated factors in a unique public health context.

## CONCLUSION

The present study revealed a high prevalence of obesity in the investigated population, reinforcing the relevance of this condition as a public health challenge. A higher prevalence of obesity was observed among younger individuals, women, Black individuals, those with better self-rated health, those who had not been vaccinated against COVID-19, and those with hypertension and diabetes *mellitus*.

These findings contribute to a better understanding of factors associated with obesity among Brazilian adults and may support the development of prevention and health promotion strategies targeted at vulnerable groups. Efforts to address obesity should consider not only individual behaviors but also broader social determinants of health, aiming to reduce the burden of obesity and its associated comorbidities.

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## AUTHOR CONTRIBUTIONS

Bazoni, P. S.: acquisition of data, analysis and interpretation of data, drafting the article, critical review of important intellectual content. Faria, R. J.: acquisition of data, critical review of important intellectual content. Santos, J. B. R.: conception and design, acquisition of data, analysis and interpretation of data, critical review of important intellectual content. Silva, M. R. R.: conception and design, acquisition of data, analysis and interpretation of data, critical review of important intellectual content. All authors have read and approved the final version of the manuscript.

## CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest.

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