Prevalence and factors associated with overweight in adults in Brazilian capitals and the Federal District, 2019

Alana Paulina de Moura Sousa[1] – orcid.org/0000-0001-9999-3441
Izabela Cristina Pereira[1] – orcid.org/0000-0001-6703-8087
Laécio de Lima Araujo[1] – orcid.org/0000-0002-1051-2240
Mariana Rodrigues da Rocha[1] – orcid.org/0000-0002-4745-9690
Hilda Maria Martins Bandeira[1] – orcid.org/0000-0001-6439-0632
Luisa Helena de Oliveira Lima[1] – orcid.org/0000-0002-1890-859X

[1]Universidade Federal do Piauí, Programa de Pós-Graduação em Saúde e Comunidade, Teresina, PI, Brazil

Abstract

Objective: To analyze the prevalence and factors associated with overweight in Brazilian capitals and the Federal District, Brazil, 2019. **Methods**: Cross-sectional study, with data from the Surveillance of risk and protective factors for chronic diseases by telephone survey, 2019. Prevalence was calculated overweight and association with sociodemographic and behavioral characteristics and health status, stratified according to sex. **Results:** The prevalence of overweight was 55.9% (95%CI 54.9;56.9), associated in men with age of 35-44 years (PR=1.87 – 95%CI 1.65;2.12), alcohol consumption (PR=1.09 – 95%CI 1.03;1.15), and hypertension (PR=1.24 – 95%CI 1.17;1.31); and in women, associated to age 45-54 years (PR=2.03 – 95%CI 1.77;2.32), habit of watching television for 3h/day (PR=1.09 – 95%CI 1.04;1.15), and poor/very poor health status (PR=1.31 – 95%CI 1.20;1.43). **Conclusion:** Overweight was observed in more than half of the sample, associated with hypertension, diabetes *mellitus* and alcohol consumption, in both sexes.

Keywords: Overweight; Obesity; Health Surveys; Cross-Sectional Studies; Adult; Aged.

Correspondence:
Alana Paulina de Moura Sousa – Av. Frei Serafim, No. 2280, Teresina, PI, Brasil. Postcode: 64000-020
E-mail: alanapaulina2012@gmail.com

Introduction

Overweight is considered as a relevant Public Health issue. The fundamental cause of obesity and overweight is an energy imbalance between calories consumed and calories expended,[1,2] and it presents a favorable condition to the emergence of chronic non-communicable diseases (NCDs) – for example, heart diseases, cancers, and diabetes *mellitus*, among others.[4]

> *Assessing nutritional status and its associated factors is of fundamental importance for the analysis of the population health conditions.*

The global prevalence of obese individuals has increased considerably when compared to obesity prevalence in 1975 and 2016, which nearly tripled. In 2016, the number of individuals who were overweight was greater than those who were underweight, a result observed in almost all continents except in parts of Sub-Saharan Africa and Asia. In that same year, nearly 2 billion adults aged 18 years and over were overweight, of these over 650 million were obese.[1] In Brazil, in 2019, 55% of adults were overweight and 20% were obese.[4]

Given the high prevalence of overweight and obesity, in 2011, the Ministry of Health implemented a Strategic Action Plan for Tackling Non-communicable Diseases (NCDs), aimed to face these diseases and associated factors, such as sociodemographic (sex, age and schooling) and behavioral (poor diet, physical inactivity, smoking and alcohol consumption) characteristics.[5]

Assessing nutritional status and its associated factors is of fundamental importance for the analysis of the population health conditions.[6] This study provides updates on the health status of Brazilian adults regarding nutritional status, and may serve as a guide for the planning of strategic actions in order to enable changes in the country's morbidity and mortality scenario.

The aim of this study was to analyze the prevalence and factors associated with overweight in the Brazilian state capitals and Federal District in 2019.

Methods

This was a cross-sectional study, based on data from the Surveillance System for Risk and Protective Factors for Chronic Diseases by Telephone Survey (Vigitel), collected by telephone interviews between January and December 2019.[4]

Vigitel is a telephone survey coordinated by the Ministry of Health. In the sampling process it used the ZIP codes (CEPs) – of 5 million telephone numbers per Brazilian state capital and the Federal District in order to randomly select household samples. Adult participants aged 18 years or older, living in the Brazilian state capitals and Federal District and who had a landline telephone at home were eligible for the 2019 Vigitel.[4] In each state capital and the Federal District, the eligible telephone numbers were randomly selected again, and fractionated into replicas of 200 lines.

Among the eligible households there was another random selection, the last one, for the selection of one of the adult residents (≥18 years old). After the random selection stage, and before starting the interview, the resident was asked about his interest in participating in the study. The objective of the interview was to identify the frequency of factors associated with the development of NCD, considering a 95% confidence interval (95%CI) and 2% maximum error.[4]

The study outcome was overweight: yes; no.

The following independent variables were searched:

a) Sociodemographic characteristics
  - Sex (female; male);
  - Race/skin color (Asian/indigenous; white; black; brown);
  - Age group (in years: 18 to 24; 25 to 34; 35 to 44; 45 to 54; 55 to 64; 65 or older);
  - Marital status (married; single; stable union; separated/divorced/widowed);
  - Schooling (in years of study: 0 to 8; 9 to 11; 12 or more).

b) Behavioral characteristics
  - Regular consumption of vegetables (5 or more times a week: yes; no);
  - Regular consumption of fruits (5 or more times a week: yes; no);
  - Regular consumption of soft drinks (5 or more times a week: yes; no);
  - Consumption of alcoholic beverages (yes; no),

- Smoking (yes; no);
- Physical inactivity (yes; no);
- Television viewing habit (<3 hours a day; ≥3 hours a day);
- Hypertension (yes; no);
- Diabetes *mellitus* (yes; no);
- Self-rated health (very good/good; regular; poor/very poor).

All variables were obtained from self-reported information collected by a data collection company, hired to conduct telephone interviews.[4]

Overweight was checked by calculating body mass index – BMI≥25.0kg/m² –,[4] obtained by dividing self-reported weight (in kilograms: kg) by self-reported height (in meters squared: m).

The independent variables of food consumption were estimated based on the questions answered by the participants:

a) the consumption of vegetables was measured by the question: *How many days a week do you usually eat at least one type of vegetable (lettuce, tomato, cabbage, carrot, chayote, eggplant, zucchini – except potatoes, cassava or yams)?*

b) the consumption of soda (or soft drink/artificial juice) five or more days a week was obtained with the question: *How many days a week do you usually drink soda or artificial juice?*

c) the indicator of fruit consumption five or more days a week was constructed from the answers to the questions: *How many days a week do you usually eat fruit?* and *How many days a week do you usually drink natural fruit juice?*

d) and the consumption of alcoholic beverages, from the answer to the question *Do you usually drink alcoholic beverages?*

Participants who gave a positive answer to the question *Are you currently smoking?*, without taking into account the frequency, quantity and duration of smoking, were classified as smokers.

For the construction of the indicator 'physical inactivity', questions were asked about physical activity during his/her free time, occupational activity, locomotion, and hygiene in his/her residence.

The indicator 'television viewing habit' (less than 3 hours/day; greater than or equal to 3 hours/day) was constructed considering the answer to the following

question: *How many hours a day do you usually watch television?*

Regarding the variables on health status, the indicator of morbidity reported for diabetes *mellitus* and hypertension was assessed by the following questions: *Has a doctor ever told you that you have high blood pressure?* and *Has a doctor ever told you that you have diabetes?*, respectively. For self-rated health, the following question was asked: *How would you classify your health status: very good, good, regular, poor or very poor?*

The calculation of the research sample was based on the minimum sample size (about 2,000 individuals per city), 95%CI, 2% maximum error and the periodicity of each risk factor in the adult individuals who were interviewed. A number of 197,600 landline telephones were randomly selected, aimed at achieving at least 2,000 interviews per state capital. Only 75,789 eligible telephones were identified, and the final sample included n=52,443 individuals interviewed and an average of 1,943 interviews conducted by state capital.[4]

Descriptive statistics were used to calculate the relative frequency of the variables, and the prevalence of overweight-obesity was estimated with the respective 95%CI. Poisson regression with robust variance was used in order to calculate the association between the variables, stratified according to gender, through the crude and adjusted prevalence ratio (PR) and its 95%CI, with a 5% significance level for the tests (p≤0.05). In the analyses of the adjusted model, only the independent variables that, in the crude model, presented p<0.20 were considered. The data analyses were conducted with Stata software, version 14.0, using the complex sample module (survey), taking as a reference the raking method.[4]

Vigitel project was evaluated and approved by the National Research Ethics Committee (CONEP), linked to the National Health Council (CNS): Opinion No. 4324071, published on June 6, 2017; Certificate of Submission for Ethical Appraisal (CAAE) No. 65610017.1.0000.0008. The individual's consent was obtained orally, at the time of the telephone interview.

Results

A total of 197,600 landline telephones were randomly selected, but only 75,789 telephones were eligible. 52,443 individuals were interviewed by the end of the

survey. The losses occurred, given the impossibility of the first approach to the selected household because either the telephone lines remained busy and nobody answered the phone calls or the call went straight to voicemail; furthermore, it was not possible to contact the adult resident selected for the individual interview, even after a great number of calls on different days, at different times.[4]

Among the 52,443 adults interviewed, the characteristics that presented the highest percentages were: female gender (54.0% – 95%CI 53.1;55.0), white race/skin color (43.8% – 95%CI 42.9;44.8), aged 25 to 34 years (25.0% – CI95% 24.1;26.1), 9-11 years of schooling (38.4% – 95%CI 37.5;39.3) and single marital status (42.8% – CI95% 41.9;43.8) (Table 1). In 2019, 55.4% (95%CI – 54.4;56.3) of adults were overweight or obese, with the highest percentage observed in males: 57.1% – 95%CI 55.6;58.7.

Brown men (58.5% – 95%CI 56.1;60.9) in the age group 35-44 (67.7% – 95%CI 64.3;70.8) had a higher percentage of overweight when compared to brown women (55.0 – 95%CI 53.2;57.0) in the age group 35-44 (55.6 – 95%CI 53.0;58.1). The highest percentage of overweight was observed in women who had 0 to 8 years of schooling (62.0% – 95%CI 60.0;64.1). The other results on percentages of overweight can be observed in Table 2.

A statistically significant association with overweight was observed in men aged 35 to 44 (PR=1.87 – 95%CI 1.65;2.12), 12 years of schooling or more (PR=1.15 – CI95% 1.07;1.24), married (PR=1.23 – 95%CI 1.15;1.32), who consumed alcoholic beverages (PR=1.09 – CI95% 1.03;1.15), with arterial hypertension (PR=1.24 – 95%CI 1.17;1.31) and diabetes *mellitus* (PR=1.09 – CI95% 1.01;1.19) (Table 3). Men who reported consuming fruit regularly (PR=0.92 – 95%CI 0.87;0.97) and smokers (PR=0.86 – CI95% 0.78;0.96) had a lower prevalence of the outcome.

Overweight was more frequent in self-reported black women (PR=1.25 – 95%CI 1.04;1.51), aged 45 to 54 (PR=2.03 – 95%CI 1.77;2,32), married (PR=1.15 – 95%CI 1.08;1.22), who reported consuming alcoholic beverages (PR=1.05 – 95%CI 1.01;1.11), and having television viewing habit, 3 hours/day or over (PR=1.09 – 95%CI 1.04;1.15), with arterial hypertension (PR=1.21 – CI95% 1.15;1.27) and diabetes *mellitus* (PR=1.09 – CI95% 1.03;1.15), and self-rated health

as poor/very poor (PR=1.31 – 95%CI 1.20;1.43). The lowest prevalence of the outcome was observed in women with 12 years of schooling or more (PR=0.87 – 95%CI 0.81;0.93) and smokers (PR=0.84 – CI95% 0.76;0.94) (Table 4).

Discussion

Based on data from the 2019 Vigitel survey, it could be seen that overweight was found in most of the interviewees. The highest percentage was observed in men. In both sexes, the highest prevalence of the outcome was associated with excessive alcohol consumption, high blood pressure and glycemic index. Being married, with television viewing habit for more than 3 hours a day and self-rated health as negative were associated with high prevalence of overweight and obesity in females.

The main limitation of the study was due to the fact that it was based on self-reported data. Self-reported data may not represent reality, due to the possibility of the respondents' perception bias, such as overestimation of their height and underestimation of their weight, resulting in an underestimation of BMI and, consequently, underestimation of overweight prevalence.[7] Therefore, we highlight the importance of using correction methods for self-reported data. Another limitation of the study was the sample representativeness, restricted to the inhabitants of the state capitals and Federal District, where few individuals have a landline telephone, although it was minimized with the use of data weighting methods adopted by Vigitel, through post-stratification, aimed at estimating the prevalence, taking into consideration the different demographic characteristics of the participants, compared to those of the other Brazilians.[8]

The high prevalence of the outcome in this study is similar to the results presented in the National Health Survey (PNS),[9] which observed the highest representation of overweight among its participants. The 2019 Vigitel[4] record reported that between 2006 and 2019, in all Brazilian regions, there was a significant temporal variation of increase in the prevalence of overweight and obesity, possibly explained by the worsening of this health problem. It is worth emphasizing the relevance of knowledge of the associated factors and the quest for strategies for their control and prevention.

Table 1 – Sociodemographic characteristics and overweight prevalence in adults (≥18 years old), in the state capitals and Federal District (n=52.443), Brazil, 2019

Variables	n	% (95%IC)[a]
Sex		
Male	18,354	46.0 (45.0;46.9)
Female	34,089	54.0 (53.1;55.0)
Race/skin color		
Asian/indigenous	1,044	2.1 (1.9;2.3)
White	22,598	43.8 (42.9;44.8)
Black	4,106	11.4 (10.7;12.1)
Brown	20,217	42.7 (41.7;43.7)
Age group (years)		
18-24	4,031	13.8 (13.1;14.4)
25-34	5,052	25.0 (24.1;26.1)
35-44	6,943	18.8 (18.1;19.6)
45-54	8,216	17.9 (17.2;18.6)
55-64	10,618	13.1 (12.6;13.6)
≥65	17,583	11.4 (11.0;11.7)
Schooling (years of study)		
0-8	15,339	28.8 (27.9;29.7)
9-11	17,688	38.4 (37.5;39.3)
≥12	19,416	32.8 (31.9;33.7)
Marital status		
Single	15,663	42.8 (41.9;43.8)
Married	20,989	35.3 (34.5;36.2)
Stable union	4,510	11.1 (10.5;11.8)
Widowed	6,586	4.8 (4.5;5.0)
Separated	4,509	6.0 (5.6;6.4)
Overweight		
No	19,900	44.6 (43.7;45.6)
Yes	27,219	55.4 (54.4;56.3)

a)95%CI: 95% confidence interval.

Source: Surveillance System for Risk and Protective Factors for Chronic Diseases by Telephone Survey (Vigitel) Ministry of Health.

The highest prevalence of the outcome was found in men aged 35 to 44 years, and in women aged 45 to 54 years. These findings corroborate the results of a systematic review and data analysis from 183 countries, in the period between 1980 and 2013, which observed that people of all ages gained weight; and those aged 20 and 40 gained weight faster.[10]

However, aging is a factor that influences weight gain. During this phase of life, the body undergoes several physiological changes, such as the menopause process in women, the decline of physical activities, muscle mass and metabolic rate.[11] A cross-sectional study collected data from 981 Brazilian adult women (20 to 60 years old) and found the highest prevalence of obesity in those who were older (50 to 60 years old), pointing to a possible association between high prevalence of obesity and advanced stages of life.[12]

Married men and women had the highest prevalence of overweight and obesity. Marriage may lead to excessive weight gain, due to the fact that married

Table 2 – Overweight prevalence, according to sociodemographic, behavioral and health status characteristics, according to gender, in adults (≥18 years old), in the state capitals and Federal District (n=52,443), Brazil, 2019

Variables	Male		Female		Total	
	%	95%CI[a]	%	95%CI[a]	%	95%CI[a]
Race/skin color						
Asian/indigenous	53.4	44.7;62.0	50.0	42.1;57.8	51.7	45.8;57.6
White	569	54.4;59.4	51.4	49.6;53.2	53.8	52.3;55.3
Black	54.3	49.6;59.0	57.6	53.5;61.5	55.9	52.3;60.0
Brown	58.5	56.1;60.9	55.0	53.2;57.0	56.7	55.2;58.1
Age group (years)						
18-24	31.1	27.9;34.5	28.7	25.6;32.1	30.0	27.8;32.4
25-34	56.9	53.1;60.7	49.3	46.1;52.5	53.0	50.6;55.5
35-44	67.7	64.3;70.8	55.6	53.0;58.1	61.0	58.9;63.0
45-54	65.0	61.5;68.3	62.7	60.3;65.0	64.0	61.7;65.7
55-64	63.4	59.9;66.8	63.0	60.5;65.0	63.0	61.1;65.0
≥65	60.6	57.8;63.4	59.3	57.5;61.0	59.8	58.2;61.3
Schooling (years of study)						
0-8	59.7	56.7;62.8	62.0	60.0;64.1	61.0	59.2;62.8
9-11	52.7	50.3;55.0	54.9	52.9;56.8	53.8	52.3;55.3
≥12	60.4	57.6;63.1	45.9	43.9;48.0	52.2	50.6;53.9
Marital status						
Single	46,6	44,1;49,0	45,0	43,0;47,1	45,8	44,2;47,4
Married	67,8	65,6;69,9	60,8	59,0;62,5	64,1	62,7;65,5
Stable union	67,3	62,4;71,9	57,2	53,1;61,1	62,3	59,1;65,3
Widowed	50,3	42,3;58,2	62,9	60,2;65,4	61,2	58,6;63,7
Separated	53,1	46,2;59,9	56,6	53,0;60,1	55,3	51,9;58,7
Vegetable consumption						
No	56.4	54.3;58.4	54.8	53.1;56.6	55.6	54.3;57.0
Yes	58.2	55.8;60.5	53.0	51.4;54.5	55.0	53.7;56.4
Regular consumption of fruits						
No	58.9	56.5;61.2	53.5	51.4;55.6	56.4	54.7;58.0
Yes	55.7	53.6;57.7	54.0	52.7;55.4	54.7	53.6;55.9
Consumption of soft drinks						
No	57.9	56.3;59.6	53.8	52.6;55.0	55.6	54.6;56.6
Yes	53.5	49.3;57.7	54.3	50.3;58.3	53.9	50.9;56.8
Consumption of alcoholic beverages						
No	55.3	53.0;57.5	54.9	53.5;56.3	55.0	53.9;56.3
Yes	59.0	56.7;61.0	51.8	49.6;53.9	55.8	54.3;57.4
Smoking						
No	58.0	56.4;59.7	54.3	53.0;55.5	56.0	55.0;57.0
Yes	50.5	45.4;55.5	48.8	44.4;53.3	49.8	46.3;53.2

Continuation

Table 2 – Overweight prevalence, according to sociodemographic, behavioral and health status characteristics, according to gender, in adults (≥18 years old), in the state capitals and Federal District (n=52,443), Brazil, 2019

Variables	Male		Female		Total	
	%	95%CI[a]	%	95%CI[a]	%	95%CI[a]
Physical inactivity						
No	58.0	56.4;59.7	54.3	53.0;55.5	54.8	53.8;55.8
Yes	50.5	45.4;55.5	48.8	44.4;53.3	58.8	56.4;61.0
Television viewing habit						
<3 hours/day	56.9	55.1;58.7	51.9	50.6;53.3	54.2	53.1;55.3
≥3 hours/day	57.9	54.6;61.2	60.0	57.8;62.3	59.1	57.2;61.0
Arterial hypertension						
No	52.8	51.0;54.6	48.4	47.0;49.8	50.2	49.4;51.7
Yes	73.0	70.1;75.8	68.4	66.4;70.3	70.3	68.6;71.9
Diabetes *mellitus*						
No	56.0	54.4;57.6	52.4	51.1;53.6	54.0	53.0;55.0
Yes	71.6	66.2;76.4	71.5	68.4;74.5	71.5	68.7;74.3
Self-rated health						
Good/very good	56.4	54.5;58.3	48.4	46.8;50.0	52.0	50.9;53.2
Regular	61.1	57.9;64.3	62.5	60.3;64.6	60.8	59.1;62.6
Poor/very poor	65.3	57.3;72.5	69.4	63.8;74.6	66.8	62.7;70.7

a) 95%CI: 95% confidence interval.

Source: Surveillance System for Risk and Protective Factors for Chronic Diseases by Telephone Survey (Vigitel) Ministry of Health.

people have less involvement in practices that could contribute to weight control, such as physical activity and a healthy diet.[13] Prioritizing people and their partners regarding overweight prevention initiatives is important for the improvement of the well-been of couples and the community.

Women who reported having a higher level of education showed low prevalence of overweight-obesity; regarding men, the opposite was observed. Data from Vigitel (2006 and 2016), also presented a lower prevalence of overweight and obesity in women who had higher educational level, while in men, the factor 'education' did not present the same result.[14]

In a study that used information from Vigitel (2006 and 2012), when analyzing the variation in body weight and the change in nutritional status of Brazilians older than 20 years of age, it could be seen a greater weight gain in women interviewed and who had a higher education level. This finding can be attributed to social factors, such as changes in work relations between genders and the incorporation of women

into higher education and better-paying occupation.[15] These factors influence weight gain, which are directly related to the increase in the acquisition and intake of industrialized foods and fast food.[16]

A lower prevalence of overweight and obesity was observed in men who reported consuming fruits regularly. Regular consumption of healthy foods, such as fruits, prevents NCDs, and these foods are sources of nutrients, fiber and water. A diet based on the consumption of healthy foods contributes to the stabilization of ideal body weight, in addition to contributing to the improvement of well-being.[17]

The high prevalence of individuals who are overweight was also associated with alcohol consumption. Similar results were found in the National Food Survey, conducted between 2008 and 2009, when the habit of drinking alcoholic beverages was positively associated with body fat accumulation. There is also the possibility that alcohol consumption is directly related to the intake of foods with high caloric density.[18]

Table 3 – Prevalence ratio (PR) of overweight for adult males (≥18 years old) according to sociodemographic, behavioral and health status characteristics, in the state capitals and Federal District (n=52,443), Brazil, 2019

Variables	Overweight					
	Crude			Adjusted		
	PR[a]	95%CI[b]	p-value	PR[c]	95%CI[b]	p-value
Race/skin color			0.361			
Asian/indigenous	1.00					
White	1.06	0.89;1.26				
Black	1.01	0.84;1.22				
Brown	1.09	0.92;1.29				
Age group			<0.001			<0.001
18-24	1.00			1.00		
25-34	1.82	1.61;2.07		1.67	1.47;1.90	
35-44	2.17	1.93;2.44		1.87	1.65;2.12	
45-54	2.08	1.85;2.34		1.73	1.52;1.98	
55-64	2.03	1.80;2.29		1.60	1.30;1.73	
≥65	1.94	1.73;2.18		1.50	1.30;1.73	
Schooling (years of study)			<0.001			<0.001
0-8	1.00			1.00		
9-11	0.88	0.82; 0.94		1.01	0.94;1.09	
≥12	1.01	0.94;1.08		1.15	1.07;1.24	
Marital status			<0,001			<0,001
Single	1.00			1.00		
Married	1.45	1.36;1.54		1.23	1.15;1.32	
Stable union	1.44	1.32;1.57		1.22	1.12;1.34	
Widowed	1.07	0.91;1.27		0.97	0.81;1.16	
Separated	1.13	0.99;1.31		1.00	0.87;1.14	
Vegetable consumption			0,259			
No	1.00					
Yes	1.03	0.97;1.08				
Regular consumption of fruits			0.042			0.003
No	1.00			1.00		
Yes	0.94	0.89;0.99		0.92	0.87;0.97	
Consumption of soft drinks			0,061			0,315
No	1.00			1.00		
Yes	0.92	0.84;1.00		0.95	0.88;1.04	
Consumption of alcoholic beverages			0.022			0,001
No	1.00			1.00		
Yes	1.06	1.01;1.12		1.09	1.03;1.15	

<div align="right">To be continue</div>

Continuation

Table 3 – Prevalence ratio (PR) of overweight for adult males (≥18 years old) according to sociodemographic, behavioral and health status characteristics, in the state capitals and Federal District (n=52,443), Brazil, 2019

Variables	Overweight					
	Crude			Adjusted		
	PR[a]	95%CI[b]	p-value	PR[c]	95%CI[b]	p-value
Smoking			0,008			0,010
No	1.00			1.00		
Yes	0.86	0.78;0.96		0.86	0.78;0.96	
Physical inactivity			0,063			0,463
No	1.00			1.00		
Yes	1.07	0.99;1.14		1.02	0.95;1.10	
Television viewing habit			0.599			
<3 hours/day	1.00					
≥3 hours/day	1.01	0.95;1.08				
Arterial hypertension			<0.001			<0.001
No	1.00			1.00		
Yes	1.38	1.31;1.45		1.24	1.17;1.31	
Diabetes *mellitus*			<0.001			0.024
No	1.00			1.00		
Yes	1.27	1.18;1.37		1.09	1.01;1.19	
Self-rated health	0.010			0.077		
Good/very good	1.00			1.00		
Regular	1.08	1.01;1.15		1.05	0.99;1.12	
Poor/very poor	1.13	1.00;1.27		1.08	0.95;1.19	

a) PR: prevalence ratio (crude model); b)95%CI: 95% confidence interval; c) PR: prevalence ratio adjusted for all variables in which the p-value was <0.20 in the crude analysis.
Source: Surveillance System for Risk and Protective Factors for Chronic Diseases by Telephone Survey (Vigitel) Ministry of Health.

The lower prevalence of the outcome was associated with smokers who were interviewed. This finding confirms data from the 2015 Vigitel,[19] which observed a lower prevalence of overweight in smokers when compared to nonsmokers. This inverse relationship is attributed to the effect of nicotine, a substance present in cigarettes: it causes decreased appetite and increased satiety, leading to reduced body weight.[20]

Obesity is a multifactorial disease. In addition, it is also associated with a reduction of physical activity level, resulting from changes in the forms of leisure, the increase in the use of computers, smartphones and tablets, and television viewing.[21] The results of this study are in line with this behavioral change: it could be seen a direct relationship between overweight and obesity and the time women spend watching TV.

The study showed a significant association between overweight and reported high blood pressure for both sexes. A positive relationship between overweight and obesity and hypertension was also found in a study on prevalence and factors associated with hypertension among Brazilian adults.[22] Obese individuals are up to three times more likely to develop hypertension.[23]

The results of this study showed a significant association between overweight and self-reported diabetes *mellitus*, regardless of gender. The 2013 PNS, in turn, showed a strong association between overweight and obesity and diabetes *mellitus*, although with a higher prevalence of diabetes in women.[9] A review study[24] which sought evidence on the relationship between overweight and diabetes *mellitus*, found that overweight and obesity are directly related

Table 4 – Prevalence ratio (PR) of overweight for adult females (≥18 years old) according to sociodemographic, behavioral and health status characteristics, in the state capitals and Federal District (n=52,443), Brazil, 2019

Variables	Overweight					
	Crude			Adjusted		
	PR[a]	95%CI[b]	p-value	PR[c]	95%CI[b]	p-value
Race/skin color			<0.001			<0.001
Asian/indigenous	1.00			1.00		
White	1.03	0.87;1.23		1.06	0.89;1.27	
Black	1.20	1.00;1.45		1.25	1.04;1.51	
Brown	1.12	0.94;1.34		1.13	0.93;1.35	
Age group (years)			<0.001			<0.001
18-24	1.00			1.00		
25-34	1.77	1.54;2.04		1.76	1.52;2.02	
35-44	2.00	1.75;2.29		1.91	1.67;2.19	
45-54	2.28	2.00;2.59		2.03	1.77;2.32	
55-64	2.25	1.98;2.56		1.95	1.70;2.24	
≥65	2.18	1.92;2.47		1.75	1.52;2.02	
Schooling (years of study)			<0.001			<0.001
0-8	1.00			1.00		
9-11	0.85	0.81;0.90		0.97	0.92;1.03	
≥12	0.72	0.68;0.76		0.87	0,81;0.93	
Marital status			<0.001			<0.001
Single	1.00			1.00		
Married	1.36	1.29;1.44		1.15	1.08;1.22	
Stable union	1.30	1.19;1.42		1.13	1.03;1.23	
Widowed	1.44	1.35;1.54		1.14	1.06;1.23	
Separated	1.26	1.16;1.37		1.04	0.96;1.13	
Vegetable consumption			0.130			0.321
No	1.00			1.00		
Yes	0.96	0.92;1.01		0.97	0.93;1.02	
Regular consumption of fruits			0.759			
No	1.00					
Yes	0.99	0.94;1.04				
Consumption of soft drinks			0.284			
No	1.00					
Yes	1.04	0.96;1.13				
Consumption of alcoholic drinks			0,018			0,030
No	1.00			1.00		
Yes	0.94	0.89;0.98		1.05	1.01;1.11	

To be continue

Continuation

Table 4 – Prevalence ratio (PR) of overweight for adult females (≥18 years old) according to sociodemographic, behavioral and health status characteristics, in the state capitals and Federal District (n=52,443), Brazil, 2019

Variables	Overweight					
	Crude			Adjusted		
	PR[a]	95%CI[b]	p-value	PR[c]	95%CI[b]	p-value
Smoking			0.050			0.002
No	1.00			1.00		
Yes	0.90	0.82;1.00		0.84	0.76;0.94	
Physical inactivity			0.014			0.258
No	1.00			1.00		
Yes	1.07	1.01;1.13		1.03	0.97;1.10	
Television viewing habit			<0.001			0.001
<3 hours/day	1.00			1.00		
≥3 hours/day	1.17	1.12;1.23		1.09	1.04;1.15	
Arterial hypertension			<0.001			<0.001
No	1.00			1.00		
Yes	1.45	1.39;1.51		1.21	1.15;1.27	
Diabetes *mellitus*			<0,001			0,001
No	1.00			1.00		
Yes	1.40	1.34;1.48		1.09	1.03;1.15	
Self-rated health			<0.001			<0.001
Good/very good	1.00			1.00		
Regular	1.29	1.23;1.35		1.20	1.14;1.26	
Poor/very poor	1.43	1.31;1.56		1.31	1.20;1.43	

a) PR: prevalence ratio (crude model); b)95%CI: 95% confidence interval; c) PR: prevalence ratio adjusted for all variables in which the p-value was <0.20 in the crude analysis.

Source: Surveillance System for Risk and Protective Factors for Chronic Diseases by Telephone Survey (Vigitel) Ministry of Health.

to onset of type 2 diabetes, and also to the implications of metabolic imbalance, blood glucose levels and the development of complications.

This study showed that poor or very poor self-rated health is an indication of a higher percentage of overweight among women, a result similar to that found in a survey conducted with adults in a city in the state of Santa Catarina.[25] In a population-based household survey in Belo Horizonte, state capital of Minas Gerais, there was a significant association between poor self-rated health, low intake of healthy foods and physical activity level lower than recommended, showing that people with negative self-rated health may present low adherence to a healthy life style.[26]

Taking these results, it can be concluded that the study allowed us to understand the prevalence of overweight and its main associated factors. The results showed an association between overweight and obesity and interviewees' sociodemographic, behavioral factors and health status. The knowledge of these factors is relevant for the development of intersectoral strategies, encouraging a healthy lifestyle, prioritizing health interventions for modifiable risk factors.

Authors' contribution

Sousa APM, Pereira IC, and Rocha MR collaborate with the conception and design of the study, data interpretation, drafting and critical reviewing of the manuscript content. Araujo LL collaborated with the conception and design of the study, data analysis and interpretation, drafting and critical reviewing of the manuscript content. Bandeira HMM and Lima LHO

collaborated with the conception and design of the study, drafting and critical reviewing of the manuscript content. All authors have approved the final version of the manuscript and declared themselves to be responsible for all aspects of the work, including ensuring its accuracy and integrity.

References

1. World Health Organization. Obesity and overweight [Internet]. 2020 Apr 1 [acesso 7 nov. 2019]. Disponível em: http: https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight

2. Malta DC, Santos MAS, Andrade SSCA, Oliveira TP, Stopa SR, Oliveira MM, et al. Tendência temporal dos indicadores de excesso de peso em adultos nas capitais brasileiras, 2006-2013. Cienc Saude Colet. 2016;21(4):1061-9. doi: http://doi.org/10.1590/1413-81232015214.12292015.

3. Agência Nacional de Saúde Suplementar (BR). Manual de diretrizes para o enfrentamento da obesidade na saúde suplementar brasileira [Internet]. Rio de Janeiro: ANS; 2017 [acesso 3 nov. 20119]. Disponível em: https://www.ans.gov.br/images/Manual_de_Diretrizes_para_o_Enfrentamento_da_Obesidade_na_Sa%C3%BAde_Suplementar_Brasileira.pdf

4. Ministério da Saúde (BR). 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 brasileiros e no Distrito Federal em 2019 [Internet]. Brasília, DF: MSi; 2020 [acesso 4 maio 2020]. Disponível em: https://portalarquivos.saude.gov.br/images/pdf/2020/April/27/vigitel- brasil-2019-vigilancia-fatores-risco.pdf

5. Ministério da Saúde (BR). Plano de ações estratégicas para o enfrentamento das doenças crônicas não transmissíveis (DCNT) no Brasil 2011-2022 [Internet]. Brasília, DF: MS; 2011[acesso 10 nov. 2019]. Disponível em: http://bvsms.saude.gov.br/bvs/publicacoes/plano_acoes_enfrent_dcnt_2011.pdf

6. Pinheiro MM, Oliveira JS, Leal VS, Lira PIC, Souza NP, Campos FACS. Prevalência do excesso de peso e fatores associados em mulheres em idade reprodutiva no Nordeste do Brasil. Rev Nutr. 2016 [acesso 7 nov. 2019];29(5):679-89. doi: https://doi.org/10.1590/1678-98652016000500006.

7. Scribani M, Shelton J, Chapel D, Krupa N, Wyckoff L, Jenkins P. Comparison of bias resulting from two methods of self-reporting height and weight: a validation study. JRSM Open. 2014;5(6):2042533313514048. doi: http://doi.org/10.1177/2042533313514048.

8. Malta DC, Bernal RTI, Nunes ML, Oliveira MM, Iser BPM, Andrade SSC, et al. Prevalência de fatores de risco e proteção para doenças crônicas não transmissíveis em adultos: estudo transversal, Brasil 2012. Epidemiol Serv Saude. 2014;23(4):609-22. doi: http://dx.doi.org/10.5123/S1679-49742014000400003.

9. Malta DC, Duncan BB, Schmidt MI, Machado IE, Silva AG, Bernal RT, et al. Prevalence of diabetes mellitus as determined by glycated hemoglobin in the Brazilian adult population, National Health Survey. Rev Bras Epidemiol. 2019;22(Suppl 2):e190006. Supl.2. doi: http://dx.doi.org/10.1590/1980-549720190006.supl.2.

10. Ng M, Fleming T, Robinson M, Thomson B, Graetz N, Margono C, et al. Global, regional, and national prevalence of overweight and obesity in children and adults during 1980–2013: a systematic analysis for the Global Burden of Disease Study 2013. Lancet. 2014 Aug 30;384(9945):766-81. doi: http://dx.doi.org/10.1016/S0140-6736(14)60460-8.

11. Samouda H, Ruiz-Castell M, Bocquet V, Kuemmerle A, Chioti A, Dadoun F, et al. Geographical variation of overweight, obesity and related risk factors: Findings from the European Health Examination Survey in Luxembourg, 2013-2015. PLoS One. 2018 Jun 14;13(6):e0197021. doi: http://dx.doi.org/10.1371/journal.pone.0197021.

12. Lisowski JF, Leite HM, Bairros F, Henn RL, Costa JSD, Olinto MTA. Prevalência de sobrepeso e obesidade e fatores associados em mulheres de São Leopoldo, Rio Grande do Sul: um estudo de base populacional. Cad Saude Colet. 2019;27(4):380-9. doi: http://doi.org/10.1590/1414-462x201900040226.

13 Janghorbani M, Amini M, Rezvanian H, Gouya MM, Delavari A, Alikhani S, et al. Association of body mass index and abdominal obesity with marital status in adults. Arch Iranian Med. 2008[acesso 4 dez. 2020];11(3):274-81. Disponível em: http://www.ams.ac.ir/AIM/NEWPUB/08/11/3/008.pdf

14. Dias Junior CS, Verona AP. Excesso de peso, obesidade e educação no Brasil. Saúde (Santa Maria). 2019;45(2):1-8. doi: http://doi.org/10.5902/2236583432482.

15. Brebal KMM, Silveira JAC, Menezes RCE, Epifânio SBO, Marinho PM, Longo-Silva G. Weight gain and changes in nutritional status of Brazilian adults after 20 years of age: a time-trend analysis (2006-2012). Rev Bras Epidemiol. 2020;23:e200045. doi: http://doi.org/10.1590/1980-549720200045.

16. Lelis CT, Teixeira KMD, Silva NM. A inserção feminina no mercado de trabalho e suas conclusões para os hábitos alimentares da mulher e de sua família. Saude Debate. 2012;36(95):523-32. doi: https://doi.org/10.1590/S0103-11042012000400004.

17. Ministério da Saúde (BR). Guia alimentar para a população brasileira [Internet]. 2a ed. Brasília, DF: MS; 2014 [acesso 4 jan. 2020]. Disponível em: https://bvsms.saude.gov.br/bvs/publicacoes/guia_alimentar_populacao_brasileira_2ed.pdf

18. Bezerra IN, Alencar ES. Association between excess weight and beverage portion size consumed in Brazil. Rev Saude Publica. 2018;52:21. doi: https://doi.org/10.11606/S1518-8787.2018052000082.

19. Francisco PMSB, Assumpção D, Borim FSA, Senicato C, Malta DC. Prevalence and co-occurrence of modifiable risk factors in adults and older people. Rev Saude Publica. 2019;53:86. doi: https://doi.org/10.11606/s1518- 8787.2019053001142.

20. Kinnunen T, Haukkala A, Korhonen T, Quiles ZN, Spiro A 3rd, Garvey AJ. Depression and smoking across 25 years of the Normative Aging Study. Int J Psychiatry Med. 2006;36(4):413-26. doi: https://doi.org/10.2190/G652-T403- 73H7-2X28.

21. Wanderley EM, Ferreira VA. Obesidade: uma perspectiva plural. Cienc Saude Colet. 2010 ;15(1):185-94. doi: http://dx.doi.org/10.1590/S1413-81232010000100024.

22. Malta DC, Bernal RTI, Andrade SSCA, Silva MMA, Velasquez-Melendez G. Prevalence of and factors associated with self-reported high blood pressure in Brazilian adults. Rev Saude Publica. 2017;51 (suppl 1):11s. doi: https://doi.org/10.1590/s1518-8787.2017051000006.

23. Galvão R, Kohlmann Júnior O. Hipertensão arterial no paciente obeso. Rev Bras Hipertens [Internet]. 2002[acesso 4 jan. 2020];9(3):262-7. Disponível em: http://departamentos.cardiol.br/dha/revista/9-3/hipertensaoobeso.pdf

24. Chobot A, Górowska-Kowolik K, Sokołowska M, Jarosz-Chobot P. Obesity and diabetes:not only a simple link between two epidemics. Diabetes Metab Res Rev. 2018;34:e3042. doi: https://doi.org/10.1002/dmrr.3042.

25. Peres MA, Masiero AV, Longo GZ, Rocha GC, Matos IB, Najnie K, et al. Self-rated health among adults in Southern Brazil. Rev Saude Publica. 2010 ;44(5):901-11. doi: https://doi.org/10.1590/S0034-89102010000500016.

26. Meireles AL, Xavier CC, Andrade ACS, Friche AAL, Proietti FA, Caiaffa WT. Self-rated health in urban adults, perceptions of the physical and social environment, and reported comorbidities: the BH health study. Cad Saude Publica. 2015;31(suppl 1):120-35. doi: https://doi.org/10.1590/0102-311X00076114.

Associate editor: Doroteia Aparecida Höfelmann – ⊙ orcid.org/0000-0003-1046-3319
Scientific Editor: Taís Freire Galvão – ⊙ orcid.org/0000-0003-2072-4834
General Editor: Leila Posenato Garcia – ⊙ orcid.org/0000-0003-1146-2641