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Prevalence of obesity and associated factors in the Brazilian population: a study of data from the 2013 National Health Survey

Prevalência e fatores associados da obesidade na população brasileira: estudo com dados aferidos da Pesquisa Nacional de Saúde, 2013

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ABSTRACT: ***Introduction:*** The prevalence of obesity is increasing at an alarming rate in many countries. Unhealthy eating and sedentary lifestyle are the main risk factors for obesity. The objective of this study was to determine the prevalence of obesity and identify the associated factors in the Brazilian adult population on the basis of data collected in the 2013 National Health Survey. ***Method:*** We analyzed the data from a sample of 59,402 adult subjects, excluding pregnant women. Body mass index (BMI) was calculated by means of weight and height measurements. Obesity was defined as BMI ≥30 kg/m². Logistic regression models were used to identify the factors associated with obesity. ***Results:*** The prevalence of obesity was 16.8% for men and 24.4% for women. Advanced age (over 50 years), low education level (no schooling or incomplete elementary school), African Brazilian and living with partner were risk factors for obesity. Leisure time physical activity and the habit of watching more than 4 hours of television per day showed significant effects for both sexes. Regarding the referred morbidity, in obese people, the chances of having a diagnosis of hypertension, diabetes, or some non-communicable chronic disease were higher. Obese men and women had significantly increased systolic blood pressure. ***Conclusion:*** Our findings emphasize the importance of public policies for the prevention of obesity and for the promotion of healthy habits in Brazilian society.

Keywords: Obesity. Anthropometry. Health surveys. Lifestyle. Morbidity. Brazil.

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RESUMO: ***Introdução:*** A prevalência de obesidade está aumentando em um ritmo alarmante em muitos países. Uma alimentação não saudável e o sedentarismo são os principais fatores de risco para a obesidade. O objetivo deste artigo foi estudar a prevalência e identificar fatores associados à obesidade na população adulta brasileira com base nos dados coletados na Pesquisa Nacional de Saúde, 2013. ***Método:*** Amostra de 59.402 indivíduos adultos, excluindo-se as mulheres grávidas. O índice de massa corporal foi calculado por meio das aferições de peso e estatura. A obesidade foi definida por índice de massa corporal ≥ 30 kg/m². Utilizaram-se modelos de regressão logística para identificar os fatores associados à obesidade. ***Resultados:*** As prevalências de obesidade foram de 16,8% para homens e 24,4% para mulheres. Idade avançada (a partir dos 50 anos), nível de instrução baixo (sem instrução ou ensino fundamental incompleto), raça/cor preta e viver com companheiro foram fatores de risco à obesidade. A atividade física no lazer e o hábito de assistir mais de 4 horas de televisão por dia mostraram associações significativas para ambos os sexos. Quanto à morbidade referida, em pessoas obesas, as chances de ter o diagnóstico de hipertensão, diabetes ou de alguma doença crônica não transmissível foram maiores. Homens e mulheres obesos tiveram a pressão arterial sistólica significativamente aumentada. ***Conclusão:*** Os achados enfatizam a importância de políticas públicas para a prevenção da obesidade e para a promoção de hábitos saudáveis na sociedade brasileira.

Palavras-chave: Obesidade. Antropometria. Inquérito de Saúde. Estilo de vida. Morbidade. Brasil.

INTRODUCTION

The prevalence of overweight and obesity is increasing at an alarming rate in many countries. Worldwide, between 1980 and 2014, the proportion of obese people more than doubled. The increase in the prevalence of obesity can be explained by the behavioral changes that have occurred in the last decades, mainly due to poor eating habits and sedentary lifestyle[1]. In middle-income countries, surveillance systems have found time trends of increasing obesity[2].

In Brazil, estimates of the prevalence of obesity, according to the System of Surveillance of Risk Factors and Protection against Chronic Diseases by Telephone Inquiry (VIGITEL)[3], increased from 15 to 18% from 2010 to 2014, in both sexes. In the Family Budget Survey (POF), the prevalence of obesity among men increased from 9.3% (POF 2002-2003)[4] to 12.7% (POF 2008-2009)[5], and in women, it went from 14.0 to 17.5% in the respective surveys.

There are different ways of measuring obesity, with body mass index (BMI) being the main indicator of nutritional status in adults[4]. This parameter is obtained by the ratio of weight to height squared, and according to the classification of the World Health Organization (WHO) proposed in 1995, values greater than or equal to 25 kg/m² indicate overweight and values greater than or equal to 30.0 kg/m² obesity[6].

Unhealthy diet and insufficient physical exercise are the main risk factors for obesity[7]. Indicators that measure the frequency of physical activity, both at leisure and at work, and

the sedentary lifestyle (television hours per day) are important to evaluate the lifestyle of people[8]. Several national and international studies have shown an association between hours watching television and overweight and obesity in the general population[9,10]. The increase in the prevalence of obesity in several countries can also be explained by a greater consumption of unhealthy foods, constituting a food category called fast food[11,12].

Obesity is closely related to various chronic diseases[13,14]. The greatest risk is diabetes mellitus[15]. In Brazil, the prevalence of diabetes in adults with normal weight/low weight is 5.4%, and in the population with obesity it is more than double (14.0%)[16]. Several studies have shown that obesity also increases the risk of hypertension[15,17]. Several types of cancer, such as colorectal cancer, also have a strong association with obesity[15,18].

Monitoring the prevalence of obesity in the Brazilian population is very important to understand the risk patterns and associated factors in the most vulnerable segments of the population, so as to subsidize public policies for the prevention of obesity from childhood and for the promotion of healthy habits in Brazilian society.

The objective of this study was to estimate the prevalence of overweight and obesity based on weight and height measurements as recorded by the National Health Survey (PNS), a population-based survey that took place in Brazil in 2013. Additionally, we aimed to identify the factors associated with obesity, among the sociodemographic characteristics and healthy habits, and to investigate the consequences of obesity on the health status of the Brazilian adult population.

METHOD

PNS is a nationwide, home-based survey conducted by the Oswaldo Cruz Foundation (FIOCRUZ) and the Ministry of Health, in partnership with the Brazilian Institute of Geography and Statistics (IBGE). The research was approved in June 2013 by the National Commission of Ethics in Research (CONEP), and fieldwork was carried out between August 2013 and February 2014.

PNS is part of IBGE's Integrated Household Survey System and uses a sub-sample of the IBGE Master Sample, with the same stratification of the primary selection units (Urgent Care Units - UPAs). For PNS, a sample was selected for three-stage conglomerates. In the first, in each stratum, the UPAs were selected. In the second stage, in each UPA, a fixed number of households were randomly selected, and in the third stage, an adult (18 years old or older) was randomly selected in each household. In total, 81,254 households were visited; of these, 69,994 were occupied. There were 64,348 home interviews and 60,202 interviews with the selected resident[18]. Additional information on the research, sampling and weighting of PNS data has been described in previous publications[19,20].

In the present study, the data for weight, height and blood pressure were used. Individual questionnaire information was also used, such as sociodemographic characteristics, lifestyle, health status and diagnosis of non-communicable chronic diseases (NCD). Of the

60,202 interviewees, all the women who reported being pregnant at the time of the interview (n = 800) were excluded, resulting in a final sample of 59,402 individuals.

The anthropometric data of weight and height were measured using calibrated instruments, according to the study protocol. Weight (kg) and height (cm) were measured with the participant barefoot, wearing light clothes and standing straight with the head aligned. Each participant had the weight and height measured two times and the average between the two measurements was the measure considered for both weight and height. BMI was calculated by dividing body (kg) by the square of the height (m). Overweight was defined as BMI ≥25 kg/m^2, and obesity ≥30 kg/m^2.

In the statistical analysis of the data, bivariate analyses, stratified by sex, were performed to determine the odds ratio (OR), with a 95% confidence interval (95%CI), and the multivariate logistic regression models, with their respective crude and adjusted ORs and CI95%, also stratified by gender, were then carried out to identify sociodemographic factors associated with obesity. The choice of independent variables was made on the basis of a literature review on the theme, and all were included in the multivariate model, regardless of their significance in the bivariate models. The association of obesity with lifestyle habits according to sex was determined by calculating the crude ORs adjusted by age bracket and schooling level, using logistic regression models.

The following sociodemographic variables were used: sex; age bracket (18 to 29 years, 30 to 39 years, 40 to 49 years, 50 to 59 years, 60 to 69 years, 70 years and older); level of schooling (no education or incomplete elementary education, complete elementary school or incomplete secondary school, complete secondary education or more); race/ skin color (white, black, brown); living with a partner (yes, no); and socioeconomic level (SEL) (A/B; C; D/E).

SEL was constructed as an adaptation of the indicator of the Brazilian Association of Research Companies (ABEP)[21], and was calculated by a sum of points attributed to the number of televisions, microwave ovens, computers, automobiles and bathrooms of a household; to the possession of a washing machine, DVD player and refrigerator; and having a maid paid monthly. In addition, points were awarded according to the level of education of the head of the household. The sum of the points was used to establish different ranges to define the following social classes: D/E (0 – 13); C (14 – 23); and A/B (24 – 50).

To characterize lifestyle, the following habits were considered: recommended consumption of fruits, legumes and vegetables (FLV) (yes or no — consumption of at least 5 servings a day of fruits, legumes or vegetables) — as recommended by the WHO[22], the minimum consumption of FLV should be 400 g/day or the equivalent of 5 portions); abusive and frequent consumption of alcohol (yes or no — excessive consumption of alcoholic beverages — 15 or more doses of alcohol per week for men and 8 or more doses for women), according to Centers for Disease Control and Prevention (CDC)[23]; obesity at 20 years of age (yes or no — calculated from the approximate weight at age 20 reported by individuals 30 years of age or older); physical activity during leisure (engage/do not engage in physical activity during leisure at the recommended level — 150 minutes or more light/moderate physical activities or 75 minutes or more vigorous physical activities per week) — according

to WHO[24], where adults should do at least 150 minutes of moderate physical activity per week, or do at least 75 min. of aerobic physical activity over the week; physical activity at work (engage/do not engage in physical activity at work — if you walk a lot on the job, do heavy cleaning, carry weight or do other heavy work that requires intense physical effort); television hours (yes or no — watch television 4 hours or more per day).

To analyze the association of obesity with health status, the following were investigated: poor self-rated health (moderate, bad or very bad) and signs and symptoms of self-reported diseases, such as difficulty walking, angina symptoms, diagnosis of hypertension, diagnosis of diabetes, diagnosis of depression and diagnosis of some NCD. To establish the associations of obesity with indicators of morbidity according to gender, the adjusted ORs by age bracket and schooling level were calculated, separately considering each health condition as the response variable of the logistic regression models.

Finally, systolic blood pressure (mmHg) and diastolic blood pressure (mmHg), both measured three times at the time of the interview, were also considered, taking the mean of the three measurements. To determine the association of obesity with blood pressure of the individuals according to gender, linear regression models were adjusted, with the response variable being either systolic blood pressure or diastolic blood pressure, to analyze the increase in blood pressure with obesity and age. Obesity associations were estimated after controlling for the age bracket and the use of medication for hypertension.

All analyses were performed using the Statistical Package for the Social Sciences (SPSS), version 21.0[25] and with the 95%CI. Since this was a stratified study of the primary sampling units and selection by grouping in three stages, the complex sampling design was taken into account in the whole statistical analysis of the data.

RESULTS

More than half of the participants were overweight (56.5% of men and 58.9% of women), and obesity was 16.8% among men and 24.4% among women. When compared by gender, both the prevalence of overweight and obesity were higher in females. Overweight and obesity are more prevalent with increasing age in both sexes, but in general, it tends to decline as of 60 years of age. In men, the highest prevalence of obesity was found in the age bracket of 40-49 years, and in women, during 50-59 years (Table 1).

The results of the logistic regressions by sex, presented in Table 2, show statistically significant OR (crude and adjusted) with the increase of age bracket for men and women. Regarding the level of schooling, in the bi- and multivariate analysis, it was observed that the lower the level of education of women, the greater was the chance of obesity. Among men, the association was direct, that is, the lower the level of education, the lower was their chance of being obese (observed only in the crude analysis). In the analysis according to SEL, women in class C had a higher risk of obesity compared to those in the A/B and D/E classes, while men in the A/B class had higher risk. The race/color variable was

statistically significant only for females, and black women showed a greater chance of obesity compared to white women. Living with a partner showed a greater chance of obesity for both sexes (Table 2).

The habit of eating FLV showed no association with obesity, after controlling for the other variables considered in the model. The abusive and frequent consumption of alcohol was not associated in any of the situations investigated. As for obesity at 20 years of age, we observed that if the person was obese at age 20, the risk of obesity was highly significant, with a crude OR of 4.3 and adjusted OR of 3.1 for both sexes. Physical activity during leisure and at work corresponded to a lower chance of obesity, but when adjusting for the other variables, physical activity during leisure was only significant for males. The habit of watching more than 4 hours of television daily was directly associated with obesity (Table 3).

Regarding associations of obesity with health status, the chance of an obese person having a poor health self-assessment was approximately 1.3 times higher for both sexes. The chance of having a diagnosis of hypertension was 2.8 times greater among men and 2.4 times greater among women, and to have the diagnosis of diabetes was 2.4 and 1.8 times higher, respectively. ORs for the diagnosis of depression or some NCD were lower but still statistically significant (Table 4).

The linear regression model, with the blood pressure response variable as measured in the study, showed that obese men had an increase in systolic blood pressure of 5.64 mmHg and diastolic blood pressure of 3.11 mmHg, whereas 3.78 and 2.04 mmHg, respectively, for women, even after control of age bracket and use of blood pressure medication (Table 5).

Table 1. Proportion (%) of overweight and obese individuals according to age bracket and sex. Brazil, 2013 National Health Survey.

Age bracket (years)	Males				Females			
	Overweight		Obesity		Overweight		Obesity	
	%	95%CI	%	95%CI	%	95%CI	%	95%CI
18 to 29	42.1	(40.2 – 44.0)	11.0	(9.7 – 12.5)	39.0	(37.2 – 40.9)	14.4	(13.0 – 15.8)
30 to 39	60.0	(57.8 – 62.1)	16.9	(15.5 – 18.4)	56.7	(55.0 – 58.5)	23.1	(21.6 – 24.7)
40 to 49	63.2	(61.1 – 65.3)	20.7	(18.9 – 22.6)	65.9	(63.9 – 67.9)	27.4	(25.6 – 29.2)
50 to 59	63.4	(60.9 – 65.8)	20.0	(18.2 – 22.1)	69.3	(67.4 – 71.1)	31.4	(29.5 – 33.5)
60 to 69	61.9	(58.9 – 64.8)	19.9	(17.3 – 22.9)	69.5	(67.0 – 72.0)	30.0	(27.7 – 32.4)
70 and older	50.3	(46.7 – 53.8)	13.7	(11.4 – 16.3	61.5	(58.8 – 64.1)	24.2	(21.9 – 26.7)
Total	56.5	(55.4 – 57.5)	16.8	(16.1 – 17.6)	58.9	(58.0 – 59.8)	24.4	(23.7 – 25.2)

95%CI: 95% confidence interval.

Table 2. Associations between sociodemographic characteristics and obesity according to sex. Brazil, 2013 National Health Survey.

Variables		Males			Females			Males			Females		
		OR*	95%CI	p-value	OR*	95%CI	p-value	OR**	95%CI	p-value	OR**	95%CI	p-value
Age bracket	18–29	1.00	–	–	1.00	–	–	1.00	–	–	1.00	–	–
	30–39	1.64	(1.38 – 1.96)	< 0.001	1.79	(1.55 – 2.07)	< 0.001	1.46	(1.21 – 1.76)	< 0.001	1.71	(1.48 – 1.80)	< 0.001
	40–49	2.11	(1.78 – 2.50)	< 0.001	2.25	(1.94 – 2.62)	< 0.001	1.91	(1.60 – 2.29)	< 0.001	2.11	(1.80 – 2.46)	< 0.001
	50–59	2.03	(1.68 – 2.44)	< 0.001	2.73	(2.35 – 3.18)	< 0.001	1.90	(1.55 – 2.33)	< 0.001	2.53	(2.16 – 2.96)	< 0.001
	60–69	2.01	(1.61 – 2.52)	< 0.001	2.56	(2.18 – 3.00)	< 0.001	2.00	(1.58 – 2.54)	< 0.001	2.38	(2.02 – 2.82)	< 0.001
	70+	1.28	(1.00 – 1.64)	0.049	1.91	(1.59 – 2.28)	< 0.001	1.39	(1.06 – 1.82)	0.016	1.78	(1.47 – 2.16)	< 0.001
Schooling	A	0.72	(0.64 – 0.81)	<0.001	1.49	(1.37 – 1.62)	<0.001	0.97	(0.83 – 1.12)	0.654	1.33	(1.19 – 1.48)	< 0.001
	B	0.76	(0.64 – 0.89)	0.001	1.22	(1.07 – 1.39)	0.003	0.94	(0.79 – 1.12)	0.467	1.20	(1.04 – 1.38)	0.011
	C	1.00	–	–	1.00	–	–	1.00	–	–	1.00	–	–
Race/color	White	1.00	–	–	1.00	–	–	1.00	–	–	1.00	–	–
	Black	0.89	(0.74 – 1.06)	0.196	1.19	(1.04 – 1.36)	0.013	1.09	(0.91 – 1.31)	0.347	1.19	(1.03 – 1.38)	0.017
	Brown	0.72	(0.64 – 0.81)	< 0.001	0.93	(0.86 – 1.01)	0.094	0.90	(0.79 – 1.02)	0.084	0.94	(0.86 – 1.02)	0.163
Living with partner	Yes	1.57	(1.41 – 1.75)	< 0.001	1.2	(1.11 – 1.30)	< 0.001	1.27	(1.13 – 1.42)	< 0.001	1.21	(1.11 –1.32)	< 0.001
	No	1.00	–	–	1.00	–	–	1.00	–	–	1.00	–	–
SEL	A/B	1.00	–	–	1.00	–	–	1.00	–	–	1.00	–	–
	C	0.71	(0.63 – 0.80)	< 0.001	1.31	(1.19 – 1.45)	< 0.001	0.77	(0.67 – 0.89)	< 0.001	1.24	(1.10 – 1.39)	< 0.001
	D/E	0.38	(0.33 – 0.44)	< 0.001	1.08	(0.97 – 1.21)	0.150	0.42	(0.34 – 0.51)	< 0.001	0.92	(0.80 – 1.05)	0.221

OR*: crude odds ratio; OR**: odds ratio adjusted by multivariate regression; 95%CI: 95% confidence interval; A: no or incomplete elementary education; B: complete elementary education or incomplete high school; C: complete high school or further; SEL: socioeconomic level.

Table 3. Associations between lifestyle indicators and obesity, according to sex. Brazil, 2013 National Health Survey.

Variables		Males			Females			Males			Females		
		OR*	95%CI	p-value	OR*	95%CI	p-value	OR**	95%CI	p-value	OR**	95%CI	p-value
FLV	Yes	1.14	(1.01 – 1.28)	0.033	0.96	(0.87 – 1.05)	0.329	1.07	(0.95 – 1.21)	0.262	0.97	(0.88 – 1.06)	0.514
	No	1.00	–	–	1.00	–	–	1.00	–	–	1.00	–	–
Abusive and frequent consumption of alcohol	Yes	0.96	(0.80 – 1.15)	0.648	0.91	(0.74 – 1.13)	0.397	0.99	(0.82 – 1.18)	0.876	1.02	(0.83 – 1.26)	0.840
	No	1.00	–	–	1.00	–	–	1.00	–	–	1.00	–	–
Obesity at 20 years old[a]	Yes	4.28	(2.82 – 6.48)	< 0.001	3.14	(2.32 – 4.24)	< 0.001	4.34	(2.90 – 6.48)	< 0.001	3.08	(2.27 – 4.19)	< 0.001
	No	1.00	–	–	1.00	–	–	1.00	–	–	1.00	–	–
Physical activity during leisure	Yes	0.88	(0.82 – 0.95)	0.001	0.92	(0.86 – 0.97)	0.002	0.87	(0.81 – 0.94)	< 0.001	0.96	(0.90 – 1.02)	0.160
	No	1.00	–	–	1.00	–	–	1.00	–	–	1.00	–	–
Physical activity at work[b]	Yes	0.75	(0.68 – 0.84)	< 0.001	0.87	(0.79 – 0.96)	0.006	0.77	(0.69 – 0.86)	< 0.001	0.91	(0.82 – 1.00)	0.051
	No	1.00	–	–	1.00	–	–	1.00	–	–	1.00	–	–
Hours of TV (more than 4 hours per day)	Yes	1.19	(1.02 – 1.38)	0.025	1.24	(1.13 – 1.36)	< 0.001	1.21	(1.04 – 1.41)	0.014	1.24	(1.13 – 1.37)	< 0.001
	No	1.00	–	–	1.00	–	–	1.00	–	–	1.00	–	–

OR*: crude odds ratio; OR**: odds ratio adjusted for age bracket and level of schooling; 95%CI: 95% confidence interval; FLV: consumption of fruits, legumes and vegetables; [a]obesity at 20 years old among individuals 30 or older; [b]among individuals who worked.

DISCUSSION

By 2014, more than 1.9 billion adults 18 years and over were overweight, and of these over 600 million were obese (11% men and 15% women)[1]. In Brazil, in 2013, according to data from the present study, the prevalence of obesity was 16.8% in men and 24.4% in women, and the prevalence of overweight was 56.5% in men and 58.9% in women. The prevalence levels found in this study are similar to those of other national surveys, such as the VIGITEL survey conducted in 2013 in all Brazilian capitals and in the Federal District, which reported that 17.5% of the population studied were obese.

In Brazil, the rate of malnutrition has been decreasing while overweight and obesity have been increasing since 1975, following the process known as nutritional transition[26]. Comparing the prevalence of overweight and obesity measured in the three surveys conducted in Brazil (POF in 2002-2003[4], POF in 2008-2009[5] and PNS 2013[27]), there is an increase in prevalence for both men and women. For men, the prevalence of overweight increased from 42.4% measured in the POF 2002-2003 to 56.5% in PNS 2013, and obesity from 9.3 to

Table 4. Associations between indicators of reported morbidity and obesity, according to sex. Brazil, 2013 National Health Survey.

Conditions		Males			Females		
		OR*	95%CI	p-value	OR*	95%CI	p-value
Self-evaluation of health (moderate, bad or very bad)	Yes	1.36	(1.22 – 1.52)	< 0.001	1.39	(1.27 – 1.16)	< 0.001
	No	1.00	–	–	1.00	–	–
Difficulty walking	Yes	1.33	(1.04 – 1.69)	0.023	1.62	(1.37 – 1.91)	< 0.001
	No	1.00	–	–	1.00	–	–
Angina symptoms	Yes	1.43	(1.19 – 1.71)	< 0.001	1.47	(1.32 – 1.64)	< 0.001
	No	1.00	–	–	1.00	–	–
Diagnosis of hypertension	Yes	2.84	(2.48 – 3.25)	< 0.001	2.40	(2.19 – 2.64)	< 0.001
	No	1.00	–	–	1.00	–	–
Diagnosis of diabetes	Yes	2.36	(1.91 – 2.92)	< 0.001	1.83	(1.58 – 2.11)	< 0.001
	No	1.00	–	–	1.00	–	–
Diagnosis of depression	Yes	1.42	(1.12 – 1.81)	0.004	1.25	(1.10 – 1.43)	0.001
	No	1.00	–	–	1.00	–	–
Diagnosis of some NCD	Yes	1.80	(1.60 – 2.02)	< 0.001	1.67	(1.53 – 1.82)	< 0.001
	No	1.00	–	–	1.00	–	–

OR: odds ratio; 95%CI: 95% confidence interval; NCD: non-communicable chronic disease; *OR adjusted for age bracket and level of schooling.

Table 5. Associations between obesity and blood pressure (systolic and diastolic) according to sex. Brazil, 2013 National Health Survey.

Variables		Systolic arterial pressure (mmHg)						Diastolic arterial pressure (mmHg)					
		Males			Females			Males			Females		
		Beta	95%CI	p-value	Beta	95%CI	p-value	Beta	95%CI	p-value	Beta	95%CI	p-value
Age bracket	1	1.00	–	–	1.00	–	–	1.00	–	–	1.00	–	–
	2	1.67	(0.98 – 2.36)	< 0.001	3.72	(3.09 – 4.34)	< 0.001	4.19	(3.66 – 4.72)	< 0.001	3.63	(3.16 – 4.10)	< 0.001
	3	4.63	(3.83 – 5.43)	< 0.001	9.02	(8.24 – 9.79)	< 0.001	6.96	(6.38 – 7.54)	< 0.001	6.36	(5.84 – 6.87)	< 0.001
	4	10.14	(8.94 – 11.34)	< 0.001	12.72	(11.85 – 13.59)	< 0.001	8.84	(8.11 – 9.58)	< 0.001	6.48	(5.89 – 7.08)	< 0.001
	5	11.34	(9.86 – 12.82)	< 0.001	18.33	(17.17 – 19.48)	< 0.001	6.30	(5.42 – 7.18)	< 0.001	5.03	(4.33 – 5.73)	< 0.001
	6	14.34	(12.74 – 15.94)	< 0.001	22.58	(21.24 – 23.91)	< 0.001	2.57	(1.61 – 3.53)	< 0.001	2.56	(1.78 – 3.34)	< 0.001
MH	Yes	5.95	(4.60 – 7.30)	< 0.001	9.48	(8.51 – 10.45)	< 0.001	2.30	(1.51 – 3.10)	< 0.001	3.69	(3.11 – 4.26)	< 0.001
	No	1.00	–	–	1.00	–	–	1.00	–	–	1.00	–	–
Obesity	Yes	5.64	(4.67 – 6.61)	< 0.001	3.78	(3.07 – 4.49)	< 0.001	3.11	(2.52 – 3.70)	< 0.001	2.04	(1.63 – 2.46)	< 0.001
	No	1.00	–	–	1.00	–	–	1.00	–	–	1.00	–	–

MH: use of medication for hypertension; 95%CI: 95% confidence interval; age bracket: 1 – 18 to 29 years, 2 – 30 to 39 years, 3 – 40 to 49 years, 4 – 50 to 59 years, 5 – 60 to 69 years, 6 – 70 years and older.

16.8% in the respective surveys. In the case of women, this increase was more notable with overweight going from 42.1% in POF 2002-2003 to 58.9% in PNS 2013, and obesity from 14.0 to 24.4%, in the respective surveys.

The highest prevalence of obesity found in this study was in the age range of 40 to 59 years in both sexes, being consistent with other national [3,28] and international[29] studies. With aging, metabolic changes occur, with a progressive loss of lean mass and an increase in the proportion of body fat, as well as decreased stature, relaxation of the abdominal musculature and kyphosis[30]. Therefore, differentiated cutoff points are recommended for the elderly[31], although WHO does not use specific cutoff points for these groups[6].

With regard to schooling, we observed that the lower the schooling of women, the greater was their chance of being obese. Among men, however, the association between obesity and the level of education was direct. These findings corroborate studies by Fonseca et al.[32] and Monteiro et al.[33], who found an inverse association between schooling and obesity only for the female population.

A systematic review of randomized controlled trials found an inverse association between physical activity and long-term weight gain[34], corroborating the findings of the present study. However, there was no statistically significant association between adequate consumption of FLV and obesity. In a cross-sectional study by Coelho et al.[35], who investigated factors correlated to increased BMI, no association was found between FLV consumption and obesity. A probable explanation for this finding is the type of study performed, in which exposure was considered together with the health problem[36].

In the present study, we found a positive association between watching more than four hours of television per day and obesity. A study based on VIGITEL 2008 found an association between the habit of watching television and being overweight[37]. Similarly, the same association was found in a population-based study in the United States, where adults who spent more than two hours a day in front of television tended to consume more calories from snacks and to engage in less physical activity[38].

In a systematic review, Singh and coworkers showed that overweight children and adolescents were more prone to obesity in adulthood[39]. In the present study, the same trend was observed. Among adults 30 or older who reported their weight at age 20, the chance of being obese at the current age was significantly higher among those who were obese at age 20. This finding refers to the concern about the eating pattern of Brazilian children and adolescents, and leads us to believe that obesity prevention should be started in childhood.

Regarding health consequences, a positive association was found between health self-assessment and obesity, reinforcing results from previous studies[40]. The diagnoses of hypertension, diabetes and angina were positively associated with obesity, as found in a cross-sectional study conducted in Londrina, Brazil in 2010[41].

Obesity was found to be significantly associated with diagnosis of depression, with a 1.42 times greater chance of a man with depression also being obese and 1.25 times greater chance among women. These results corroborate the findings described by Atlantis and Baker[42] in a meta-analysis of epidemiological studies in Brazil. With regard to obesity and

hypertension, we found that non-obese as well as obese people had increased blood pressure. Still, several international studies have shown that increased BMI is significantly associated with increased systolic and diastolic blood pressure[43,44].

The main limitations of this study were related to the study design of PNS. Because it is a cross-sectional survey, the analysis of temporality and causality is compromised[36], regarding the factors and effects of obesity. As for BMI cutoff points for the diagnosis of overweight and obesity, there is evidence that ethnic factors and age may influence these measures, but the WHO criteria are not specific for these groups[6,30]. In addition to possible problems in the measurement of weight and height by the investigator, this was a home survey in which the plan for positioning the equipment was not always adequate.

CONCLUSION

This study identified the factors associated with obesity and demonstrated its adverse effects on various health problems. The prevalence of obesity was 16.8% for men and 24.4% for women. Age of 50 years and older, no schooling or incomplete elementary school, black race/color and living with a partner were risk factors for obesity. Obese men and women had a greater chance of having a diagnosis of hypertension, diabetes or some NCD, and significantly increased blood pressure. Therefore, the increase in obesity in the country, observed with the data from PNS, emphasizes the importance of public policies directed at the prevention of obesity from childhood and to the promotion of healthy habits in Brazilian society.

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