

# Overweight and abdominal in adult population of Teresina, PI

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## ABSTRACT

**Objective:** To determine the prevalence of overweight and abdominal fat in the adult population in the urban area of Teresina, PI, Brazil. **Methods:** This is a cross-sectional study with probability sampling by conglomerates. The study evaluated 464 adults, 20 to 59 years of age, living in the urban area of Teresina, PI, Brazil. Nutritional status was classified according to body mass index (BMI), and abdominal fat accumulation was estimated according to waist circumference. The significance level was set at 5% ( $p < 0.05$ ). **Results:** The prevalence of overweight and obesity according to nutritional status, based on BMI, was 30.0% and 7.7%, respectively. An increase in the proportion of overweight and obesity among men with progressively higher family income was observed. Higher rates of obesity were found among individuals 50 to 59 years of age with stable relationships and nonsmokers. An association between individual or family income and presence of abdominal fat was not observed in the population. **Conclusion:** The prevalence of overweight in the study population follows the national trend. Proportions of overweight and obesity were higher among men and increased with age. Women and married individuals showed a greater tendency for abdominal obesity.

**Keywords:** Overweight; obesity; body mass index; waist-hip ratio.

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## INTRODUCTION

Obesity is a chronic disease and a known risk factor for several debilitating diseases, with a high social cost, such as type 2 diabetes, hypertension, strokes, cardiopathies, dyslipidemias, and some types of cancer<sup>1</sup>.

The pattern of fat distribution can reveal some predisposition of an individual for developing complications, and it is widely known that central adiposity is associated to metabolic imbalances and cardiovascular risk<sup>2</sup>. Thus, it has been demonstrated that abdominal obesity can increase in up to 10 times the risk for developing type 2 diabetes, besides also being a risk factor for hypertension in adults with ages between 20 and 45 years<sup>3</sup>.

The prevalence of overweight and obesity is universally increasing, achieving, according to estimates of the Pesquisa de Orçamentos Familiares (POF), approximately 40% and 12.7%, respectively, of the adult Brazilian population in 2002-2003<sup>4</sup>. The increased prevalence of overweight, both in developing and developed countries, is associated with a high incidence of a number of clinical and surgical pathologies<sup>5</sup>.

Anthropometry is the method used more often in obesity diagnosis, since it is cheaper, non-invasive, universally applicable, and has good acceptance by the population<sup>6</sup>. Body mass index (BMI) and waist circumference are among the most used anthropometric indicators. At a populational level, waist circumference is more practical and easy to use in large scale studies, as well as in health promotion actions, allowing the identification of levels of intervention in the population<sup>7</sup>.

The objective of the present study was to identify the prevalence of overweight and abdominal fat in adults in the urban area of Teresina, PI, Brazil.

## METHODS

This is a transversal, domiciliary-based study with probability sampling by conglomerates. Calculation of the sample size was based on POF, which estimated a 40% prevalence of overweight in the Brazilian adult population<sup>4</sup>. Confidence level of 95% and margin of error of 3% was established. The sample population was distributed in five strata, according to zoning provided by Census<sup>8</sup>, and redistributed in clusters corresponding to neighborhoods in each zone of Teresina, PI.

Parameters investigated were divided in two blocks. The first one included socio-demographic parameters, such as age, gender, marriage status, religion, race, number of persons residing in that house, schooling, and familial and individual income. The second block included anthropometric parameters, such as weight, height, body mass index (BMI), and waist circumference (WC).

Height and weight measurements were performed with the subject barefoot and wearing light clothes. Height was calibrated to the nearest 0.5 cm with a tape

measure fixed vertically on a wall in order to make a 90 degree angle with the floor. Weight was measured using a portable scale, previously calibrated to the proximal 0.1 kg. Waist circumference was obtained by using a non-elastic tape measure with 0.5 cm scale, placed without applying pressure, in a horizontal plane, in the smaller circumference between the inferior border of the last rib and the iliac crest<sup>9</sup>.

Global nutritional state was classified according to body mass index (BMI), based on cutting points proposed by the WHO<sup>10</sup>. Normal weight was defined as BMI > 18.5 and < 25 kg/m<sup>2</sup>; overweight, BMI ≥ 25 and < 30 kg/m<sup>2</sup>; and obesity as BMI ≥ 30 kg/m<sup>2</sup>. The expression overweight was used to define individuals with excess weight or obesity, i.e., individuals with BMI ≥ 25 kg/m<sup>2</sup>.

Weight circumference (WC) was used to identify the pattern of fat distribution, which, besides being associated with abdominal fat mass (subcutaneous and intra-abdominal), is considered as an indicator risk of cardiometabolic diseases<sup>11</sup>. Waist circumference was classified, according to cut-off points suggested by the WHO<sup>10</sup>, as increased when equal or greater than 80 cm for females; equal or greater than 94 cm for males; and very increased when equal or greater than 88 cm for females and equal and greater than 102 cm for males.

This study was approved by the Ethics on Research Committee of Universidade Federal do Piauí. The study was conducted in compliance with the recommendations of Resolution 196/96 of the National Health Council on studies involving humans<sup>12</sup> and the Declaration of Helsinki<sup>13</sup>. All individuals enrolled signed an informed consent after explanations on the objectives and possible benefits and risks of the study.

Data were processed in the BioEstat 5.0<sup>14</sup> and EpiInfo 6.04b<sup>15</sup> programs. The level of significance was established at 5% ( $p < 0.05$ ), and Analysis of Variance (ANOVA), Tukey post-hoc test, and Chi-square test were used for statistical analysis.

## RESULTS

Four hundred and sixty-four individuals, ages 20 to 59 years, with a mean age of 35.82 years, mostly females (64.6%), participated in this study. When evaluating the distribution of the study population regarding their nutritional state, we observed that 30% and 7.7% of adults were overweight or obese, respectively. Regarding gender, the proportion of overweight individuals, i.e., BMI greater than 25 kg/m<sup>2</sup>, was 35.4% in females, and 42% in males (Table 1).

Table 2 shows the distribution of overweight and obesity prevalence of, based on BMI by socioeconomic characteristics of the population according to gender. Among individuals with stable relationships, 44.8% ( $p = 0.014$ ) of females were overweight, while 54.8% of males were overweight ( $p = 0.0008$ ). An association between individual

income and prevalence of overweight and obesity was not observed in males and females, but an increased proportion of overweight and obesity was observed among males with increased familial income ( $p = 0.02$ ).

We also observed that, among females aged 50 to 59 years, the proportion of overweight and obesity was 70.5% ( $p = 0.0001$ ), while the proportion of overweight and obesity in males in the same age group was 50%. In the 40 to

**Table 1** – Distribution of adult population in the urban area of Teresina, PI, according to gender and nutritional status

Nutritional state	Gender						Test $\chi^2$
	Female		Male		Total		
	n	%	n	%	n	%	
BMI							
Low weight	24	8	4	2.4	28	6	0.054
Normal weight	170	56.7	91	55.5	261	56.3	
Overweight	84	28	55	33.5	139	30	
Obesity							
Grade I	14	4.7	11	6.7	25	5.4	
Grade II	6	2	3	1.8	9	1.9	
Grade III	2	0.7	0	0.0	2	0.4	

**Table 2** – Prevalence of overweight and obesity based on BMI according to socio-economic characteristics, physical exercise, smoking, family history of obesity, and gender in the adult population of the urban area of Teresina, PI, Brazil

Variables	Female			Test $\chi^2$ P	Male			Test $\chi^2$ P
	Eutrophic	Overweight and Obesity	Total		Eutrophic	Overweight and Obesity	Total	
	%	%	%		%	%	%	
Age group (years)								
20-29	76.8	23.2	100	0.0001	69.1	30.9	100	0.027
30-39	73.8	26.2	100		57.1	42.9	100	
40-49	49.3	50.7	100		40.9	59.1	100	
50-59	29.5	70.5	100		50	50	100	
Marriage status								
Single	69.7	30.3	100	0.014	73.1	26.9	100	0.0008
Married	55.2	44.8	100		45.2	54.8	100	
Individual income (minimal wage)								
< 1	60.3	39.7	100	0.57	62.5	37.5	100	0.09
$\geq 1$ e <3	67.1	32.9	100		55.4	44.6	100	
$\geq 3$	56.5	43.5	100		35.5	64.5	100	
Family income (minimal wage)								
< 1	69.7	30.3	100	0.33	92.3	7.7	100	0.02
$\geq 1$ e <3	68.0	32.0	100		58.8	41.2	100	
$\geq 3$	59.5	40.5	100		51.6	48.4	100	
Physical activity								
None	67.0	33.0	100	0.0006	58.6	41.4	100	0.57
Yes	42.6	57.4	100		54.1	45.9	100	
Schooling								
< College	58.4	41.6	100	0.02	56.1	43.9	100	0.71
$\geq$ College	76.0	24.0	100		59.5	40.5	100	
Smoking								
Non-smoker	38.3	61.7	100	0.0008	40.0	60.0	100	0.04
Smoker	75.9	24.1	100		63.6	36.4	100	
Former smoker	65.0	35.0	100		62.1	37.9	100	
Family history of obesity								
No	62.5	37.5	100	0,14	57.7	42.3	100	0.19
Yes	76.8	23.2	100		25.0	75.0	100	

49 age group, the proportion of males with overweight and obesity was 59.1% ( $p = 0.027$ ) (Table 2).

It was also observed that 57.4% of the females physically active were obese or overweight ( $p = 0.0006$ ), but the same did not apply to males ( $p = 0.57$ ). Among women with higher education, approximately 24% had a BMI above 25 kg/m<sup>2</sup>, although this proportion was higher in women who did not have the same degree of schooling (41.6%) ( $p = 0.02$ ). Among males, a positive relationship between schooling and BMI was not observed ( $p = 0.71$ ) (Table 2).

Regarding the results in Table 2, it was observed among female smokers a proportion of overweight and obesity of 24.1% ( $p = 0.0008$ ), and this proportion among female non-smokers was 61.7%. Regarding male non-smokers, approximately 60% had a BMI above 25 kg/m<sup>2</sup>, while among male smokers, the proportion was

36.4% ( $p = 0.04$ ). As for family history of obesity, an association with overweight and obesity was not observed ( $p > 0.05$ ) (Table 2).

Table 3 shows the distribution of abdominal obesity prevalence in both genders in the study population. Higher proportion of abdominal obesity in the age group of 50 to 59 years, stable relationship, and non-smokers ( $p < 0.05$ ) was observed. Additionally, an association between individual or family income and abdominal obesity was not observed ( $p > 0.05$ ).

Analysis of results in Table 3 shows that 61.3% of females who are physically active ( $p = 0.0002$ ) and 43.6% of females who did not finish college ( $p = 0.01$ ) had abdominal obesity. Besides, among males, an association between a family history of obesity and presence of abdominal obesity was observed ( $p = 0.04$ ), but this relationship was not present in females ( $p = 0.62$ ).

**Table 3** – Prevalence of abdominal obesity according to socio-economic characteristics, physical exercise, smoking, family history of obesity, and gender in the adult population of the urban area of Teresina, PI, Brazil

Variables	Abdominal obesity							
	Female		Total	Test	Male		Total	Test
	Absent %	Present %		x <sup>2</sup> p	Absent %	Present %		x <sup>2</sup> P
Age group (years)								
20-29	77.5	22.5	100	0.0001	88.6	11.4	100	0.0005
30-39	70.0	30.0	100		86.2	13.8	100	
40-49	39.2	60.8	100		62.2	37.8	100	
50-59	31.1	68.9	100		55.0	45.0	100	
Marriage status								
Single	68.8	31.2	100	0.002	90	10	100	0.001
Married	51.2	48.8	100		67	33	100	
Individual income (Minimum wage)								
< 1	55.6	44.4	100	0.72	84.0	16.0	100	0.055
≥1 e <3	57.0	43.0	100		77.8	22.2	100	
≥3	48.1	51.9	100		58.8	41.2	100	
Family income (Minimum wage)								
< 1	63.9	36.1	100	0.86	92.9	7.1	100	0.32
≥1 e <3	59.5	40.5	100		75.9	24.1	100	
≥3	59.1	40.9	100		75.0	25.0	100	
Physical activity								
None	64.7	35.3	100	0.0002	75.2	24.8	100	0.54
Yes	38.7	61.3	100		79.4	20.6	100	
Schooling								
< College	56.4	43.6	100	0.01	76.8	23.2	100	0.98
≥ College	75.0	25.0	100		76.9	23.1	100	
Smoking								
Non-smoker	36.0	64.0	100	0,0009	60.0	40.0	100	0.01
Smoker	70.0	30.0	100		78.8	21.2	100	
Former smoker	63.2	36.8	100		83.5	16.5	100	
Family history of obesity								
No	95.5	4.5	100	0,62	98.4	1.6	100	0.04
Yes	94.3	5.7	100		92.1	7.9	100	

## DISCUSSION

WHO<sup>16</sup> considers overweight and obesity, which affect all age groups, the main public health problems in the world. In the present study, the prevalence of overweight (30%) and obesity (7.7%) observed are similar to the national pattern<sup>4</sup>.

POF results regarding males revealed a prevalence of overweight and obesity of 41% and 8.9%, respectively. Among females, 40% are overweight and 13.1%, obese<sup>4</sup>. Analyzing the proportion of overweight and obesity between genders, we observed that approximately 28% of females and 33.5% of males were overweight, while a little over 7% of females and 8.5% of males were obese. These results were lower than those of Gigante *et al.*<sup>17</sup> in a study on the prevalence of overweight and obesity and associated factors in Brazil, in which 39% of females and 47% of males were overweight and, in both genders, 11% were obese.

We observed that the proportion of overweight and obesity increase with age, and this characteristic is greater in females. These results are in agreement with the POF data of 2002-2003, in which obesity with age partially reproduces the pattern of overweight, which tends to increase more slowly and steadily with age in women (20 to 64 years) and more quickly in men (20 to 54 years)<sup>4</sup>.

Francischi *et al.*<sup>3</sup> justified weight gain with aging due to factors such as reduction in basal metabolism due to loss of muscle mass, reduction of physical activities, and increase in food consumption.

When stratification by income is investigated, an increase in overweight and obesity prevalence with increased income was observed in males, which was also reported by Abrantes *et al.*<sup>18</sup> On the other hand, Monteiro *et al.*<sup>19</sup> observed greater prevalence of overweight and obesity in low income families.

In the present study, the prevalence of overweight and obesity, both identified by BMI and WC, was greater among those individuals in stable relationships, without difference between genders. The influence of marital status on nutritional status is not clear, since in some studies, such as that of Sarturi *et al.*<sup>20</sup>, a positive relationship between those variables was not observed. On the other hand, in other studies, such as that by Rosmond and Björntorp, who demonstrated using waist/hip relationship that married women had a higher risk of obesity<sup>21</sup>.

Physical activities were associated with greater prevalence of overweight and obesity in females, but this association was not observed in males. This finding can be probably explained by the fact that many people start physical activities because they are overweight. These individuals would benefit from physical activities, since physically active individuals have better insulin sensitivity, glucose tolerance, and lipid metabolism, as well as lower morbidity and mortality than those with a sedentary lifestyle<sup>22</sup>.

An inverse relationship between overweight and schooling was observed in females, similar to the results of the study by Gigante *et al.*<sup>17</sup>; however, schooling was not associated with overweight in males.

Accumulation of abdominal fat is a more serious risk factor for cardiovascular diseases risk and changes in glucose-insulin homeostasis than generalized obesity<sup>23</sup>. A positive association between increased waist circumference and higher blood pressure levels has been demonstrated<sup>24</sup>. In the present study, the presence of abdominal obesity evaluated by waist circumference was related to gender and age, corroborating the observations of Martins *et al.*<sup>25</sup> who observed an increased prevalence of abdominal obesity with age and in females. Unlike the study of Veras *et al.*<sup>26</sup>, with college students, which did not observe a relationship between abdominal obesity and gender.

A strong concordance between the classification of obesity according to BMI and WC in females was observed. This was also observed by Velásquez-Meléndez *et al.*<sup>23</sup> who reported a concordance greater than 80% between overweight and obesity, determined by BMI and WC in women.

Regarding physical activities, the present study diverges from others, since a greater prevalence of abdominal obesity among physically active patients was observed, while other studies indicate a relationship between obesity and a sedentary lifestyle<sup>27</sup>. As mentioned, this result is probably due to the fact that physically active individuals usually had weight problems.

In the present study, smoking was associated with obesity, as defined by BMI and WC, and greater prevalence of obesity was observed among non-smokers. Other studies also have reported higher prevalence of obesity among non-smokers and former smokers. However, these data should be carefully analyzed, since there is no conclusive evidence of direct association between smoking, easy weight loss and weight maintenance in stable condition, or the large effect of quitting on weight gain<sup>28</sup>. On the other hand, even if smoking had a proven effect on weight gain, it would be much smaller than the benefits associated with healthier lifestyle habits, and cessation of smoking is among them<sup>2</sup>.

## CONCLUSION

The prevalence of overweight and obesity in the urban population of Teresina, PI, Brazil, follows the same trend of the Brazilian population, being a target group for health actions to control non-transmissible diseases and complications. The proportion of overweight and obesity was greater in males and increased with age, especially among females. Females showed a greater tendency for abdominal obesity, as well as individuals in stable relationships.



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