



## CLÍNICA

### Excess of weight and associated factors: a population-based study

Excesso de peso e fatores associados: um estudo de base populacional

Exceso de peso y factores asociados: un estudio de base poblacional

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Palavras-chave: Obesidade; Sobrepeso; Doenças Crônicas; Fatores de Risco; Epidemiologia.

Palabras clave: Obesidad; Sobrepeso; Enfermedad Crónica; Factores de Riesgo; Epidemiología.

### RESUMO

O **objetivo** do estudo foi estimar a prevalência de excesso de peso e fatores associados, entre adultos e idosos.

Trata-se de estudo transversal, de base populacional, realizado em cidade de porte médio do norte de Minas Gerais, Brasil. Foram entrevistados indivíduos com idade igual ou superior a 18 anos. A análise múltipla foi realizada através da regressão de Poisson, adotando-se, como variável dependente, excesso de peso ( $IMC \geq 25\text{kg/m}^2$ ). A prevalência de excesso de peso foi 53,7%. Após a análise múltipla, permaneceram associadas ao excesso de peso: idade igual ou superior a 40 anos, ser casado/viver em união estável, ingerir bebida alcoólica, fumar, apresentar hipertensão arterial e depressão.

Os **resultados** destacam uma preocupante prevalência de excesso de peso. Entre as variáveis associadas, no modelo final, encontram-se as relacionadas com estilo de vida. Nesse sentido, as

ações de promoção da saúde são fundamentais para prevenção do excesso de peso e obesidade entre adultos e idosos.

## RESUMEN

Este estudio tuvo como **objetivo** estimar el predominio del sobrepeso y factores asociados entre adultos y ancianos.

Es un estudio transversal, de base poblacional, realizado en ciudad de tamaño medio del Norte de Minas Gerais, Brasil. Fueron entrevistadas personas de edad igual o superior a 18 años. Se realizó un análisis múltiple por regresión de *Poisson*, tomando, como variable dependiente, el sobrepeso ( $IMC \geq 25\text{kg/m}^2$ ). El predominio del sobrepeso fue el 53,7%. Después del análisis múltiple, permanecieron asociados al sobrepeso: edad igual o superior a 40 años, estar casado/vivir en unión estable, el consumo de alcohol, el tabaquismo, la hipertensión y depresión.

Los **resultados** ponen de manifiesto una preocupante prevalencia del sobrepeso. Entre las variables asociadas, en el modelo final, están las relacionadas con el estilo de vida. En este sentido las acciones de promoción de la salud son fundamentales para la prevención del sobrepeso entre los adultos y los ancianos.

## ABSTRACT

The **objective** of the study was to estimate the prevalence of excess of weight and associated factors among adults and elders.

It is a cross-sectional and population-based study, done in a medium size city of the north of Minas Gerais, Brazil. Interviewed people had 18 or over. The multiple analysis was done through regression of *Poisson*, adopting as a dependent variable, the overweight ( $IMC \geq 25\text{kg/m}^2$ ). The prevalence of excess of weight was of 53.7%. After the multiple analysis, the factors that remained associated with excess of weight were: age 40 or over, being married/living together, drinking alcohol beverages, smoking, having high blood pressure and depression.

The **results** show a preoccupant prevalence of overweight. Among the associated variables, in the final model, factors related to health style were found. By this, the action to promote health is fundamental to prevent the overweight and obesity among adults and elderly people

## INTRODUCTION

The obesity is considered a Chronic non-communicable disease (NCD) and its occurrence, frequently, is associated to other co-morbidities, like diabetes *mellitus*, cardiovascular diseases, high blood pressure, myocardial infarction and some types of cancer <sup>(1)</sup>. The prevalence of overweight and obesity is in ascent in developed countries as well as those in development. It is estimated that, if the average levels of body mass index continues to go up, in 2015, more than 1.5 billion people will be above weight <sup>(2)</sup>. In Brazil, data of the “*Pesquisa de Orçamentos Familiares de 2008-2009 (POF)*” have shown that, in the last 35 years, there was a continuous increase of overweight and obesity in the population over 20 <sup>(3)</sup>.

On the last years, factors like economic growth, bad eating habits and sedentarism have influenced the increase of overweight and obesity, what leads to the growth of morbimortality by chronic degenerative diseases, especially the cardiovascular ones <sup>(4)</sup>. The chronic diseases, if not prevented and treated correctly and adequately, imply in elevated costs to the health system, for they demand medical assistance of high complexity <sup>(5)</sup>.

Population based studies about obesity are little frequent in national and international literature. Almost always the existent studies are limited to population of big cities <sup>(6)</sup>. Indicator survey that help in the monitoring of reduction actions and risk factors control

for overweight and obesity is important <sup>(5, 7)</sup> as well as surveys that are held in medium size cities that are representative to other cities of the country.

The present study had as an objective to estimate the prevalence of the excess of weight and associated factors among adults and elderly people of a medium size city of the north of Minas Gerais, Brazil.

## METHODS

It is a cross-sectional, analytic, population based study developed in the city of Montes Claros, in the north of the state of Minas Gerais. The target population was defined by individuals with age 18 or over, in the moment of the research, urban and rural inhabitants of the specified city. For the sample calculation, the prevalence estimated of excess of weight (overweight and obesity) was considered 50% <sup>(8)</sup>, confidence level 95% and the marginal error sample 3%. The size of the sample was multiplied by a correction factor ("deff") of 2.0, due for this having a complex sampling, through conglomerating in two stages of sampling units: census sector and dwelling. To finalize the sample calculation 10% was added to it to compensate eventual loss. Therefore, the estimated sampling size for the study was of 2150 individuals.

In the process of sampling allocation, firstly there was a selection of census sectors, in a proportional way among the rural and urban sectors, 43 were sorted, 40 being urban and three rural. In each census sector, 50 houses were sorted, and in each only one adult/elder dweller was interviewed, when not present, three tentative visits were done, before the substitution to the next house to the right or the next house number.

Pregnant women, women who had given birth and bedridden people or people who had difficulty on the data collection procedures, as for instance, individuals with mental disorder reported by the person's own family members, were excluded from this research.

The data collection was done through students of health courses of the State University of Montes Claros (Unimontes), previously trained in a 20 hour course, including orientation and role-playing<sup>(9)</sup>. A pilot study was done with 20 interviewees with the goal to calibrate interviewers to field work and questionnaire application. In this pilot study, two census sectors were chosen, one of high population density and the other of low density, searching to anticipate possible situations in the data collecting. The data of the pilot study were not inserted in the final analysis. The researchers went to the field in two, being followed by supervisors, responsible to the quality control of data collection.

The collection instrument was based in a risk factors monitoring of chronic diseases questionnaire, proposed by the System of Risk and Protective Factors for Chronic Non-Communicable Diseases through Telephone Interviews (Vigitel) <sup>(8)</sup>, however the collection was help through direct contact and not through telephone.

Besides the application of the questionnaires, anthropometric data collection was also done. The weight was measured in a portable scale Balmak, with capacity for up to 130 kg. The weight and height measures were taken twice and done at the end of the interview, the individuals were barefoot and clothes were weighed. The height measures were done through non elastic tape measure, in a flat vertical surface, registrating the value in centimeters. Weight classification was done through the Body Mass Index (BMI), following the recommendation the Worldwide Health Organization that considers overweight BMI among 25 and 29.9 kg/m<sup>2</sup> and obesity same or over 30 kg/m<sup>2</sup> <sup>(10)</sup>.

The study had as a variable answer or outcome the excess of weight that includes overweight and obese people <sup>(10)</sup>. The independent variables were: sex, age, marital status, skin color (auto-selected), education, daily life habits (physical activity, smoking and alcoholic drinking) and self-referred morbidities.

For the data analysis, initially descriptive statistics were done, to characterize the frequency of the studied event. Then a bivariate analysis was done between the excess of weight and independent variables. After the bivariate analysis, all the independent variables with association up to 20% ( $p \leq 0.20$ ) were used in the multivariate analysis, Poisson regression, remaining at the final model the variables with significance of 5% ( $p < 0.05$ ). The statistical treatment involved the use of weight sampling, from the primary sample units (census sectors) and secondary sample units (dwelling), to compensate the uneven probabilities of selection among the sample elements <sup>(11)</sup>. The data were processed through software IBM Statistical Package for the Social Sciences (SPSS<sup>®</sup>) version 22.0.

All of the ethic aspects were considered in the development of the research. The data collection was initiated after the project approval by the Ethic Committee in Research of the State University of Montes Claros (Unimontes), document number 153234, and the respondents signed the free will and clarified consent term.

## RESULTS

2418 people were asked to participate of the study, therefore 268 refused to participate or were not located in at least three attempts (refusal rate of 11.1%). From the 2150 participants, 1367 (63.6%) were women. The average age was 43.58 ( $\pm 16.8$ ). Among the interviewees, 1251 (58.2%) referred themselves as having brown skin and 903 (42.0%) presented up to eight years of education study. There was a high number of individuals being single/widow/separated ( $n=1079$ ; 50.2%).

One part (5.2%) of the interviewees refused to have anthropometric measures taken. Among the ones that agreed, the prevalence of the overweight and obesity were 35.2% e 18.5%, respectively. The average BMI of the sample was 25.47 kg/m<sup>2</sup> ( $\pm 5.07$ ). The main characteristics of the group are shown in the Table 1.

**Table 1:** Distribution of the sample according to the demographic, socioeconomic, behavior and biologic variables. Montes Claros, Minas Gerais, Brazil.

Variables	N 2150	%
<b>Gender</b>		
Female	1367	63.6
Male	783	36.4
<b>Age (years)</b>		
18-29	547	25.4
30-39	434	20.2
40-49	394	18.3
50-59	334	15.5
$\geq 60$	441	20.5

<b>Skin color</b>		
White	562	26.1
Black	277	12.9
Yellow	54	2.5
Brown	1251	58.2
Indigenous	6	0.3
<b>Marital status</b>		
Single/Widow/Separated	1079	50.2
Married/Living together	1071	49.8
<b>Education (years)</b>		
0-8	903	42.9
9-11	806	38.3
≥12	394	18.7
<b>Body Mass Index *</b>		
< 18.5	122	6.0
18.5 -24.9	822	40.3
25-29.9	717	35.2
≥ 30	377	18.5
<b>Life habits **</b>		
Abusive alcohol consumption	312	14.5
Tobacco consumption	246	11.4
Regular physical activity		
<b>Self-referred morbidities **</b>		
Hypertension	559	26.0
Dyslipidemia	219	10.2
Osteoporosis	108	5.0
Arthritis/ Rheumatism	124	5.8
Depression	118	5.5
Low back pain	249	11.6
Diabetes	94	4.4

(\*) n=2038 (\*\*) Referred data only of the affirmative answers

Table 2 shows the result of the bivariate analysis among the social-demographic and behavior and excess of weight characteristics.

**Table 2:** Bivariate analysis of the social-demographic and behavior characteristics according to the excess of weight. Montes Claros, Minas Gerais, Brazil.

Variables	BMI		Prevalence Ratio	
	≥ 25	< 25	PR (IC95%)	p-value
	(%)*	(%)*		
<b>Gender</b>				
Female	53.6	46.4	0.99 (0.90 – 1.08)	0.821
Male	54.2	45.8	1	
<b>Age (years)</b>				
≥40	62.0	38.0	1.42 (1.29 – 1.56)	<0.001
<40	43.5	56.5	1	
<b>Skin color</b>				
White	55.6	44.4	1,04 (0.95 – 1.15)	0.362
Non-white	53.2	46.8	1	
<b>Marital status</b>				
Single/Widow/Separated	59.0	41.0	1,20 (1.10 – 1.31)	<0.001
Married/Living together	48.9	51.1	1	
<b>Education (years)</b>				
≤ 8	58.1	41.9	1,16 (1.06 – 1.26)	0.001
> 8	50.0	50.0	1	
<b>Abusive alcohol consumption</b>				
Yes	60.5	39.5	1,14 (1.02 – 1.28)	0.014
No	52.7	47.3	1	
<b>Tobacco consumption</b>				
Yes	48.0	52.0	0.87 (0.75 – 1.02)	0.090
No	54.6	45.4	1	
<b>Regular physical activity</b>				
Yes	53.3	46.7	0.92 (0.82 – 1.04)	0.224
No	57.3	42.7	1	

\*Percentage value and prevalence ratio (Confidence Interval 95%) adjusted by the drawing effect.

Table 3 registers the associated test between the auto-referred morbidities and the excess of weight. From the data of the tables 3 and 4 the used variables in multiple regression were identified ( $p \leq 0.20$ ).

**Table 3:** Bivariated Analysis of auto-referred morbidities according to the excess of weight. Montes Claros, Minas Gerais, Brazil.

Variables	BMI		Prevalence Ratio	
	≥ 25	< 25	PR (IC95%)	p-value
	(%)	(%)		
<b>Hypertension</b>				
Yes	72.7	27.3	1.54 (1.42 – 1.67)	<0.001
No	46.9	53.1	1	
<b>Dyslipidemia</b>				
Yes	68.2	31.8	1.30 (1.17 – 1.46)	<0.001
No	52.1	47.9	1	
<b>Osteoporosis</b>				
Yes	59.7	40.3	1.11 (0.93 – 1.32)	0.213
No	53.5	46.5	1	
<b>Arthritis / Rheumatism</b>				
Yes	61.7	38.3	1.15 (0.99 – 1.35)	0.066
No	53.3	46.7	1	
<b>Depression</b>				
Yes	69.8	30.2	1.31 (1.15 – 1.50)	<0.001
No	52.9	47.1	1	
<b>Low back pain</b>				
Yes	60.7	39.3	1.14 (1.01 – 1.29)	0.024
No	52.9	47.1	1	
<b>Diabetes</b>				
Yes	72.0	28.0	1.35 (1.17 – 1.56)	<0.001
No	52.9	47.1	1	

\*Percentage value and prevalence ratio (Confidence Interval 95%) adjusted by the drawing effect.

Table 4 shows that, after multiple analysis of Poisson regression, remained associated to the excess of weight: having 40 or over, being married or living together, ingesting alcoholic beverages, being a smoker, having auto-referred high blood pressure and depression.

**Table 4:** Regression of the multiple analysis of Poisson to variables associated to the excess of weight. Montes Claros, Minas Gerais, Brazil.

Variables	PR	CI(95%)	p-value
<b>Age (years)</b>			
≥40	1.26	1.14 – 1.40	<0.001
<40	1		

<b>Marital status</b>			
Single/Widow/Separated	1.17	1.07 – 1,27	<0.001
Married/Living together	1		
<b>Abusive alcohol consumption</b>			
Yes	1.33	1.19 – 1.48	<0.001
No	1		
<b>Tobacco consumption</b>			
Yes	0.80	0.68 – 0.92	0.003
No	1		
<b>Hypertension</b>			
Yes	1.40	1.28 – 1.53	<0.001
No	1		
<b>Depression</b>			
Yes	1.18	1.03 – 1.35	0.013
No	1		

\*Percentage value and prevalence ratio (Confidence Interval 95%) adjusted by the drawing effect.

## DISCUSSION

The results of this present study showed that the majority of the studied population has excess of weight. This finding highlights the magnitude of the problem and emphasizes the importance of similar studies to be done, which results can subsidize the elaboration of strategies to prevent and control, as other authors reported<sup>(5, 6, 12)</sup>. Moreover, the excess of weight presents itself as a challenge for the XXI century, for it is a chronic non-communicable disease that grows on sight<sup>(6)</sup>.

The overweight and obesity prevalence, found in this research, have shown similar to those found in other studies that were also conducted in countryside cities of the country<sup>(6, 13-15)</sup>. In another research denominated Vigitel, done in 2010, in 27 Brazilian cities, the frequency of adults with overweight showed more elevated results (48.5%)<sup>(16)</sup>. In a study done in 199 countries, in the period of 1980 to 2008, it was observed that the average number of BMI had gone up 0.4 kg / m<sup>2</sup> each decade for men and 0.5 kg/m<sup>2</sup>, each decade, for women<sup>(17)</sup>. Literature highlights that many anthropometric researches done in countries in development reveal a big variation in the overweight and obesity prevalence in adults<sup>(16)</sup>.

In the search for associated factors to the excess of weight, the results of the present study demonstrated a significant association with age same or over 40. These results agree with others observed in other studies<sup>(3, 18)</sup>. The population aged  $\geq 40$ , men and women, presents the bigger proportion of excess of weight in relation to the younger<sup>(13, 19)</sup>. For some authors, the increase of numbers in BMI among middle aged and elderly people can be attributed to a question of life style, as the ingestion of caloric foods associated with reduction of physical activity<sup>(6, 20)</sup>.

It was also registered the association of marital status or people living together with the excess of weight. In another study with a big sampling, it was also found the same

association of marital status with the excess of weight, being the bigger prevalence of excess of weight observed among those who referred themselves as living together, for both sex (56.9% for men and 46.6% for women)<sup>(21)</sup>.

Another observed association in this study was the relation among the ingestion of alcoholic beverages and the excess of weight. This finding is consistent with the results in another study, which demonstrated that the abdominal adiposity, measured by the circumference of the waist and the relation of the hip, increased linearly with the quantity of alcohol ingested indicating a relation dose-response<sup>(22)</sup>. In other studies there was not a significant association with the ingestion of beverages and the excess of weight<sup>(13, 23)</sup>. The verified divergence on the above results can be due to the methodological differences, which imply the necessity of more reseraches, with a similar method, to clarify the question.

The habit of smoking presented itself statistically associated with the excess of weight, denoting minor prevalence of obese people or with overweight among the group of non smokers. A similar result was observed in another research, in which it was found a greater prevalence of obesity among the non smoking individuals (17.6%) and the ex-smokers (18.8%)<sup>(6)</sup>. In a research of the *World Health Organizations Monitoring Cardiac Disease (WHO MONICA)* done in 42 populations, the smokers had a BMI significantly higher than the non smokers<sup>(24)</sup>. In a cross-sectional study with base on secondary data, obtained by Vigitel 2008, it was found a bigger prevalence of excess of weight among the smokers that were men (59%) and as for the women it was not observed a significant statistical difference<sup>(23)</sup>. Data from a case-control study in Rio Grande do Sul verified a relation between smoking and BMI. In this study the frequency of smokers increased in a linear way among the overweight, obese and with morbid obesity individuals<sup>(25)</sup>. Some authors point out that smoking is associated with the increase of BMI in a dose dependent way, reflecting an increase of prevalence of obesity on individuals with a high dose of fume<sup>(25, 26)</sup>. This can be due to the adoption of various risk behaviors, as lack of physical activity, a less healthy diet and a bigger ingestion of alcohol<sup>(27)</sup>.

The prevention programs for obesity and tobaccoism must consider the complex relation that there are in these two risk factors<sup>(28)</sup>. According to a study in the Columbus University, USA, the most important public politics in health nowadays should be towards the control of tobaccoism and obesity, for they are costly for the State<sup>(29)</sup>.

In the multiple analysis, among the auto-referred morbidities, the high blood pressure and depression remained in the final model. The obesity is highly associated to the elevation of the levels of the pressure, what characterizes as an important cardiovascular risk factor<sup>(30)</sup>. In researches done in Brazil, it was found an association among overweight, obesity and high blood pressure<sup>(23, 30)</sup>. A study done with university students in Piauí (Brazil) revealed that, even with the young population, the increase of body weight and abdominal obesity were factors that determined the elevation of blood pressure<sup>(31)</sup>. In Bambuí, Minas Gerais, in the multivariate analysis, an association among obesity, high blood pressure and high levels of triglycerides was found<sup>(15)</sup>.

The relation among overweight, obesity and depression was studied in a meta-analysis that aimed at verifying if, longitudinally, the overweight and obesity increased the risk of developing depression and if the depression increases the risk of developing overweight and obesity. In the study, it was observed that there was a bidirectional association between depression and obesity. Obese people had an increase of 55% in risk of developing depression over time, while depressed people

had a 58% risk of becoming obese. The association between depression and obesity was greater than in the association between depression and overweight<sup>(32)</sup>.

In this present study associations among excess of weight and education or physical activity were not identified in the final model. Other studies demonstrated divergent associations among these variables. In developed countries the prevalence of excess of weight is bigger in individuals with low education<sup>(33, 34)</sup>. In countries in development, it is noticed a positive association between the excess of weight and the increase of education years for the male sex, while the female sex the association is inverse<sup>(23)</sup>. There is lack of data that relate the practice of physical activity with anthropometric data, in a way that favors a better comprehension of this relation<sup>(35)</sup>. The registering of the controversial observations in literature highlights the complexity of the envolved factors with the excess of weight and the necessity of more studies and new approaches to the theme.

The results in this study must be considered in the light of some limitations. The fact that the study was conducted in only one city restricts the generalization of the results. There is also a inherent limitation to cross-sectional studies as to the bias of the reverse causality, especially in relation to the behavior variables. In this type of research the measures are done in the same moment, space and time, not being possible to distinguish the cause-effect of the problem<sup>(21)</sup>. It must be considered, however, that it is a study with primary data that approached a big and representative sample of the population studied, in a medium size city. Another aspect that must be highlighted refers to the use of the information of auto-referred morbidities, that although there are widely used, requires caution when comparing with other results.

## **CONCLUSION**

The results in this present research are similar to the national and international studies that reveal a big prevalence of excess of weight in the population. A special care has been given to the excess of weight, because besides being a chronic condition, it is a predisponent factor for the development of other diseases. This can be proven from results obtained that almost half of the participants have high blood pressure.

For a while, people are mentioning a “epidemic obesity”, however, actions towards reverting this picture are not being effective. The evaluation of the tendency and evolution of the prevalence of excess of weight/obesity contributes to the formulation of strategies of intervention that reinforces the importance of elaboration of public politics towards the prevention and control of these. We also have to consider that among the associated variables in the final model are related to life style. In this sense, the actions to promote health are fundamental for the adoption of a life style that avoids or minimizes the exposition to the conditioning and determinant factors of excess of weight.

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