Original article

Abdominal obesity and associated factors in quilombola communities in Northern Minas Gerais, Brazil, 2019

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Patrícia de Sousa Fernandes Queiroz[1] – orcid.org/0000-0002-4616-1593
Leonardo de Paula Miranda[1] – orcid.org/0000-0002-9756-8393
Pâmela Scarlatt Durães Oliveira[1] – orcid.org/0000-0001-6084-5011
João Felício Rodrigues Neto[1] – orcid.org/0000-0001-8189-6539
Cristina Andrade Sampaio[1] – orcid.org/0000-0002-9067-4425
Thatiane Lopes Oliveira[2] – orcid.org/0000-0002-2035-3407
Maria Luiza Oliveira Silva[3] – orcid.org/0000-0002-1705-5775

[1]Universidade Estadual de Montes Claros, Programa de Pós-Graduação em Ciências da Saúde, Montes Claros, MG, Brazil
[2]Instituto Federal do Norte de Minas Gerais, Departamento de Ensino Médio e Técnico, Januária, MG, Brazil
[3]Universidade Estadual de Montes Claros, Departamento de Enfermagem, Montes Claros, MG, Brazil

Abstract

Objective: To analyze the prevalence of abdominal obesity and associated factors in quilombola communities in Northern Minas Gerais, Brazil. **Methods:** This was a cross-sectional study conducted in 2019 through structured interviews and waist circumference measurement; Poisson regression was used, separated by gender, to calculate prevalence ratios (PR) of abdominal obesity adjusted by independent variables and 95% confidence interval (95%CI). **Results:** 56.6% (95% CI 50.9;62.0) of the observed quilombolas presented abdominal obesity; in the adjusted analysis, among men, there was an association of the outcome with age ≥60 years old (60-69 years old: PR=2.52 - CI95% 1.33; 4.75), not being a smoker (PR=1.73 - 95%CI 1.17;2.55) and reported arterial hypertension (PR=1.42 – 95%CI 1.11;1.80), while in women, it was associated with age ≥50 years old (50-59 years old: PR=1.25 - 95% CI 1.01;1.54), smoking cessation (PR=1.26 - 95% CI 1.00; 1.58), consumption of chicken with skin (PR=1.09 - 95% CI 1.00;1.19) and hypertension (PR=1.22 - 95% CI 1.11;1.36). **Conclusion:** There was high prevalence of abdominal obesity among quilombolas. It was higher in the elderly, smokers, former smokers and those with hypertension.

Keywords: Risk Groups; African Continental Ancestry Group; **Ethnic Groups**; Abdominal Obesity; Public Health; Cross-sectional Studies.

Correspondence:
Patrícia de Sousa Fernandes Queiroz – Av. Presidente Kennedy, No. 515, Bairro Edgar Pereira, Montes Claros, MG, Brazil. CEP: 39400-174
E-mail: patriciasousandes@yahoo.com.br

Introduction

Obesity is one of the greatest public health challenges, due to its association with important morbidity and mortality, and also because of its huge economic and social costs.[1,2] Abdominal obesity is associated with excess body fat and has a complex and multifactorial etiology, resulting from the interaction of historical, ecological, economic, social, cultural, emotional and political factors.[2,3]

> *Precarious health of quilombola communities and limited access to collective goods, such as schools, roads, simplified water supply systems and health care, impose living conditions with low level of quality and human development.*

Obesity is present in both developed and developing countries.[4] In Brazil, the largest population-based study on the subject, the National Health Survey (PNS), conducted in 2013, showed that the prevalence of abdominal obesity was 38%, 22.3% in males and 52% in females, an example of the severity of this epidemic in rural and urban areas.[5]

This profile indicates the importance of the monitoring of nutritional status of adults, through interventions to evaluate anthropometric data and define therapeutic actions aimed at abdominal obesity and associated comorbidities.[6] It is important to highlight that the gradual weight gain is seen in men and women of different ages and, even in economically disadvantaged populations, such as the quilombola population, obesity can coexist with malnutrition.[1]

The remaining quilombola communities were recognized by the Brazilian State, with the publication of Presidential Decree No. 4,887, on November 20, 2003, especially in art. 2:

> Art. 2 Ethic-racial groups are considered remaining quilombola communities, according to criteria of self-attribution, with their own historical trajectory, endowed with specific territorial relations, with presumption of black ancestry related to resistance to historical oppression suffered.[7]

Precarious health of quilombola communities and limited access to collective goods, such as schools, roads, simplified water supply systems and health care, impose living conditions with low level of quality and human development.[8,9] However, there is still little specific information on health conditions of quilombola communities in Brazil.[10] Therefore, it is imperative to invest in research in order to assess the real health status of these communities, mostly geographically isolated and, consequently, with restricted access to health services. Obtaining new information can contribute to the implementation of public policies capable of minimizing the vulnerability of quilombola communities and favoring the expansion of their concepts and practices of health and well-being.[11] The objective of this study was to analyze the prevalence of abdominal obesity and associated factors in quilombola communities in the north of Minas Gerais State, Brazil.

Methods

This was a cross-sectional study conducted in 2019, with quilombola communities located in the northern health macro-region of Minas Gerais State, Brazil.

The North health macro-region is comprised of 86 municipalities, gathered in nine health microregions, which composed the clusters of this study.

The quilombola communities were identified from data available in the local Municipal Health and Social Development Secretariats, the Alternative Agriculture Center, and on the Documentation Center Eloy Ferreira da Silva and the Palmares Cultural Foundation websites. There were seventy-nine communities and approximately 19,000 quilombola inhabitants in the North health macro-region.

Self-declared quilombolas, aged 18 years or older, residing in the selected communities were considered eligible for the study; those with mental and cognitive impairment were excluded, as reported by their families and/or the health team, thus making it impossible for them to understand and answer the questionnaire, in addition to the elderly who were screened through the mini-mental state examination.[12]

To define the participating communities in the study, cluster sampling with probability proportional to size was designed. Thirty communities were selected along with the households to be visited. Initially, a starting point was identified in the center of each community, for the first interview and the

following ones in spiral motion, given the spatial configuration of quilombola communities. The interviewers visited the households and continued with the visits until reaching the sample size previously proposed for each community.

The following variables were analyzed: the dependent variable of the study, 'abdominal obesity' (no; yes), and the independent variables:

a) Sociodemographic

– Age group (in years: 18 to 29; 30 to 39; 40 to 49; 50 to 59; 60 to 69; 70 or over);

– Marital status (married; separated/divorced/widowed; single);

– Race/skin color (black; brown; other);

– Schooling (years of study: illiterate; up to 8; 8 or more);

– Family income (in minimum wage, R$ 996.00: ≤0.5; >0.5 to ≤1.0; >1.0 to ≤1.5; >1.5).

b) Health-related behavior

– Alcohol consumption (no; yes);

– Smoking (smoker; former smoker; never smoked);

– Consumption of red meat with fat (yes; no);

– Consumption of chicken with skin (yes; no);

– Vegetable consumption 5 or more times a week (yes; no);

– Fruit consumption 5 or more times a week (yes; no);

– Consumption of sweet food 5 or more times a week (yes; no);

– Salt intake (high/very high; adequate; low/very low);

– Physical activity (<150 minutes per week; ≥150 minutes per week).

c) Health conditions

– Self-perceived health (positive; negative);

– Hypertension, diabetes *mellitus*, heart disease, lung disease, high cholesterol, anemia, chronic kidney disease, depression and cancer (yes; no).

For data collection, a semi-structured questionnaire was used, based on the PNS 2013.[13] Data were collected between January and August 2019 by trained interviewers.

A pre-test study was conducted in a quilombola community that had not been eligible, to verify the adequacy of the questionnaire and the time required to conduct the interview. We chose to apply the instrument with 5% of the main study sample. After the pre-test, textual adjustments and changes were made in the ordering of questions. Individuals who took part in the pre-test did not comprise the final sample of the study.

To measure the waist circumference, a 150 cm inextensible measuring tape with 0.1 cm precision was used, positioned at the midpoint between the 10th rib and the upper edge of the iliac crest.[14] To define the research outcome - abdominal obesity - the cut-off point for Latin American people was adopted - waist circumference ≥90 cm for men and ≥80 cm for women.[15]

For the calculation of the sample, a prevalence of 50% for chronic non-communicable diseases (NCDs) precision of 5 percentage points, 95% confidence interval, drawing effect equal to 2.0 and estimated 20% of losses were adopted, due to the heterogeneity of the events analyzed, totaling 905 individuals to be included.

Data analysis was stratified by gender. Categorical variables were described by their frequency distributions; and numerical variables, by measures of central tendency and dispersion (mean and standard deviation).

To identify the factors associated with abdominal obesity, the hierarchical multiple regression model was used. The distal level was composed by the block of sociodemographic characteristics; the intermediate level by the block of health-related behavior; and the proximal level by the block of health conditions. Poisson regression with robust variance was used to calculate prevalence ratios (PR) of abdominal obesity by independent variables and 95% confidence intervals (95%CI). Bivariate analyses were performed using Pearson's chi-square test, in each block; at this stage, the variables that presented p-value <0.25 were eligible for multiple analysis.[16] The distal block was the first to make up the model, acting as an adjustment factor for the other levels. Subsequently, the intermediate level was included, only the variables with p-value <0.05 remained in the model, adjusted for the variables of the previous block. The process for the proximal block was repeated, adjusted for the prior variables. Multicollinearity diagnosis was performed from the calculation of the variance inflation factor (VIF): VIF values>5 indicate problems with coefficient estimation, due to the presence of multicollinearity between the independent variables.[17]

The model was evaluated using the deviance (statistics), according to which, p>0.05, shows that the model has quality of adjustment. This test evaluates whether the values predicted by the model are diverted from the observed values, which the Poisson distribution does not predict. If the p-value is lower than the adopted significance level, the null hypothesis that the Poisson distribution allows a good adjustment,

is rejected. The analyses were performed using the statistical program SPSS®, Windows®,version 22.0, and corrected by the complex design effect.

The study project was approved by the Research Ethics Committee of the State University of Montes Claros (CEP/Unimontes): Opinion No. 2,821,454, issued on August 14, 2018. All participants signed the Free and Informed Consent Form.

Results

The final sample of the study was comprised of 1,025 individuals, exceeding the minimum amount needed to represent the area of interest; pregnant or puerperal women and individuals who had answered the questionnaire, but did not authorize the measurement of the waist circumference were excluded. There was 6.8% of loss of the initial sample; there were no refusals.

The prevalence of abdominal obesity was 56.6% (95% CI 50.9;62.0), being higher in women (71.9% - 95% CI 66.3;76.9) than in men (32.4% – 95% CI 25.1;40.6) (Table 1). There was a predominance of women aged 18 to 39 years (39%), and men aged 50 to 69 years (45.1%). In both sexes, there was greater participation of black people, married men and women, those with up to 8 years of schooling and individuals whose family income was 0.5 to 1 minimum wage. Among men, there was a higher frequency of smokers and former smokers (59.9%: 25.1% and 34.8%, respectively), alcohol consumption (53.5%), and poor eating habits. Self-reported medical diagnoses of diseases were more prevalent among women, except for cancer cases.

In the bivariate analysis, among women, the variables that showed a statistical association with abdominal obesity were: age group, marital status, schooling, smoking, consumption of chicken with skin, vegetables, fruits and sweet food, self-perceived health and self-reported hypertension, diabetes *mellitus* and high cholesterol (Table 2). Multicollinearity between these variables was not identified, since the VIF values ranged from 1.04 to 2.18. Among men, the variables associated with the outcome were: age group, marital status, family income, smoking and self-reported hypertension, diabetes *mellitus* and high cholesterol (Table 2). The multicollinearity diagnosis estimated VIF values between 1.07 and 2.41, suggesting that there was no collinearity between the independent variables.

After adjustments for potential confounding factors in multiple analysis, a statistically significant association was observed in women with abdominal obesity and in the age group 50-59 (PR=1.25 - 95% CI 1.01;1.54), former smokers (PR=1.26 - 95% CI 1.00; 1.58), who reported consuming chicken with skin (PR=1.09 - 95% CI 1.00;1.19), and self-reported arterial hypertension (PR=1.22 – 95% CI 1.11;1.36) (Table 3). Among men, abdominal obesity was associated with the age group 60-69 (PR=2.52 - 95% CI 1.33; 4.75), non-smokers (PR=1.73 – 95% CI 1.17;2.55), self-reported arterial hypertension (PR=1.42 – 95% CI 1.11;1.80) (Table 4).

Discussion

The results of the study showed a high prevalence of abdominal obesity in quilombola communities in the north of Minas Gerais State, especially among women.

This study presented limitations, such as self-reported chronic diseases and health-related behaviors, given that they are susceptible to the interference of lack of attention and memory. In addition, the different waist circumference cut-off points used to define abdominal obesity, reported in the various studies that were analyzed, may compromise a reliable comparison of data related to the prevalence of abdominal obesity.

Among its attributes, this research stands out for the sample being representative of quilombola communities in the north of Minas Gerais and for the few studies related to the evaluation of abdominal obesity in this population group. As far as the researchers know, this study was conducted with the largest number of quilombolas in the region.

Different national surveys, conducted with quilombola communities in 2012, 2015 and 2016,[8.18.19] and with other populations in 2010,[6.11.20] showed a higher prevalence of abdominal adiposity and/or general obesity in women. A study based on data from the PNS 2013 observed a higher prevalence of abdominal obesity in famales, especially in rural areas.

In the rural context, manual work can be considered a protective factor related to obesity, especially in men.[5] A study conducted in quilombola communities located in the Middle São Francisco Region, Bahia State, in 2012, reinforces that a higher prevalence of abdominal adiposity in women is possibly related to lower physical effort during work, compared to men in the same region.[19]

Table 1 – Characteristics of the quilombola population (n=1,025) according to gender, north of Minas Gerais State, Brazil, 2019

Characteristics	n (%)[a]	Women n (%)[a]	Men n (%)[a]	p-value[b]
Abdominal obesity				<0.001
No	441 (43.4)	175 (28.1)	266 (67.6)	
Yes	584 (56.6)	449 (71.9)	135 (32.4)	
Age group (years)				0.010
18-29	176 (16.2)	114 (18.3)	62 (13.3)	
30-39	174 (18.2)	117 (20.7)	57 (14.5)	
40-49	149 (15.4)	87 (15.4)	62 (15.5)	
50-59	181 (19.8)	99 (16.2)	82 (24.9)	
60-69	258 (19.5)	142 (19.1)	116 (20.2)	
≥70	163 (10.9)	94 (10.4)	69 (11.6)	
Marital status				0.002
Married	610 (59.3)	359 (58.0)	251 (61.3)	
Separated/divorciado/widowed	219 (17.6)	152 (21.0)	67 (12.4)	
Single	280 (23.1)	151 (21.0)	129 (26.2)	
Race/skin color				0.762
Black	602 (52.2)	355 (50.6)	247 (54.6)	
Brown	435 (42.1)	265 (44.9)	170 (38.0)	
Other	73 (5.7)	42 (4.5)	31 (7.4)	
Schooling (years of study)				0.005
Illiterate	259 (19.7)	150 (17.4)	109 (23.1)	
<8	518 (49.8)	291 (48.6)	227 (51.5)	
≥8	326 (30.5)	219 (33.9)	107 (25.4)	
Family income (minimum wage)				0.002
≤0.5	201 (20.6)	136 (23.5)	65 (16.2)	
>0.5 a ≤1.0	523 (47.8)	320 (49.0)	203 (45.9)	
>1.0 a ≤1.5	129 (11.2)	65 (9.7)	64 (13.5)	
>1.5	226 (20.4)	119 (17.7)	107 (24.4)	
Alcohol consumption				<0.001
No	631 (58.4)	420 (66.8)	211 (46.5)	
Yes	444 (41.6)	210 (33.2)	234 (53.5)	
Smoking				<0.001
Smoker	163 (15.2)	57 (8.6)	106 (25.1)	
Former smoker	316 (26.0)	146 (20.0)	170 (34.8)	
Never smoked	605 (58.8)	442 (71.4)	163 (40.1)	
Consumption of red meat with fat				<0.001
Yes	337 (31.9)	153 (24.9)	184 (42.3)	
No	709 (63.9)	464 (70.2)	245 (54.4)	
Consumption of chicken with skin				<0.001
Yes	424 (40.3)	211 (32.3)	213 (52.1)	
No	608 (53.9)	404 (62.1)	204 (41.8)	

a) Corrected by complex design effect; b) Pearson chi-square test.

To be continued

Continuation

Table 1 – Characteristics of the quilombola population (n=1,025) according to gender, north of Minas Gerais State, Brazil, 2019

Characteristics	n (%)[a]	Women n (%)[a]	Men n (%)[a]	p-value[b]
Vegetable consumption 5 or more times a week				<0.001
Yes	391 (34.7)	267 (38.1)	124 (29.6)	
No	714 (65.3)	390 (61.9)	324 (70.4)	
Fruit consumption 5 or more times a week				<0.001
Yes	278 (25.9)	199 (31.8)	79 (17.2)	
No	826 (74.1)	457 (68.2)	369 (82.8)	
Consumption of sweet food 5 or more times a week				0.238
No	144 (12.9)	92 (13.7)	52 (11.8)	
Yes	959 (87.1)	563 (86.3)	396 (88.2)	
Salt intake				0.002
Very high/high	117 (10.7)	63 (9.2)	54 (13.0)	
Adequate	558 (52.3)	310 (50.3)	248 (55.3)	
Low/very low	426 (37)	281 (40.5)	145 (31.8)	
Physical activity (minutes/week)				0.760
<150	887 (80.3)	527 (80.2)	360 (80.4)	
≥150	206 (19.7)	120 (19.8)	86 (19.6)	
Self-perceived health				0.009
Positive	541 (49.7)	301 (46.9)	240 (53.9)	
Negative	564 (50.3)	357 (53.1)	207 (46.1)	
Arterial hypertension				<0.001
No	665 (64.3)	361 (58.8)	304 (72.1)	
Yes	427 (35.7)	283 (41.2)	144 (27.9)	
Diabetes *mellitus*				0.295
No	990 (89.6)	581 (88.4)	409 (91.3)	
Yes	109 (10.4)	70 (11.6)	39 (8.7)	
Heart disease				0.010
No	981 (90.7)	572 (7.0)	409 (93.1)	
Yes	113 (9.3)	80 (11.0)	33 (6.9)	
Lung disease				0.100
No	1.014 (92.6)	595 (91.3)	419 (94.6)	
Yes	84 (7.4)	57 (8.7)	27 (5.4)	
High cholesterol				0.001
No	859 (79.2)	490 (74.9)	369 (85.7)	
Yes	240 (20.8)	165 (25.1)	75 (14.3)	
Anemia				0.001
No	852 (77.3)	431 (65.3)	421(94.8)	
Yes	252 (22.7)	225 (34.7)	27 (5.2)	
Chronic kidney disease				0.128
No	1,060 (92.8)	625 (94.5)	435 (97.6)	
Yes	44 (4.2)	31 (5.5)	13 (2.4)	

a) Corrected by complex design effect; b) Pearson chi-square test.

To be continued

Continuation

Table 1 – Characteristics of the quilombola population (n=1,025) according to gender, north of Minas Gerais State, Brazil, 2019

Characteristics	n (%)[a]	Women n (%)[a]	Men n (%)[a]	p-value[b]
Depression				<0.001
No	935 (84.2)	520 (77.5)	415 (94.1)	
Yes	166 (15.8)	134 (22.5)	32 (5.9)	
Cancer				0.044
No	1.075 (98.1)	645 (98.3)	430 (97.8)	
Yes	25 (1.9)	10 (1.7)	15 (2.2)	

a) Corrected by complex design effect; b) Pearson chi-square test.

Table 2 – Prevalence of abdominal obesity by sex, according to sociodemographic characteristics, health-related behavior and health conditions of the quilombola population (n=1,025), northern Minas Gerais, Brazil, 2019

Characteristics	Female: n (%)[a]		p-value[c]	Male: n (%)[b]		p-value[c]
	Abdominal obesity			Abdominal obesity		
	No	Yes		No	Yes	
Age group (in years)			<0.001			0.003
18-29	55 (49.3)	54 (50.7)		48 (83.1)	07 (16.9)	
30-39	36 (31.0)	79 (69.0)		37 (80.0)	14 (20.0)	
40-49	21 (26.4)	65 (73.6)		35 (61.4)	21 (38.6)	
50-59	18 (14.1)	79 (85.9)		46 (65.1)	32 (34.9)	
60-69	24 (17.5)	102 (82.5)		57 (59.2)	39 (40.8)	
≥70	19 (29.3)	63 (70.7)		43 (61.8)	22 (38.2)	
Marital status			<0.001			<0.001
Married	80 (23.6)	264 (76.4)		135 (61.0)	91 (39.0)	
Separated/divorced/widowed	32 (24.0)	104 (76.0)		34 (56.5)	26 (43.5)	
Single	63 (44.6)	81 (55.4)		97 (88.5)	18 (11.5)	
Race/skin color			0.448			0.356
Black	89 (24.1)	252 (75.9)		155 (70.9)	72 (29.1)	
Brown	73 (33.1)	171 (66.9)		90 (63.0)	55 (37.0)	
Other	13 (23.5)	26 (76.5)		21 (66.6)	08 (33.4)	
Schooling (in years of study)			<0.001			0.665
Illiterate	35 (27.0)	99 (73.0)		65 (73.4)	28 (26.6)	
<8	55 (21.0)	220 (79.0)		135 (64.4)	74 (35.6)	
≥8	85 (38.7)	129 (61.3)		64 (68.8)	32 (31.2)	
Family income (minimum wage)			0.377			0.040
≤0.5	45 (34.3)	88 (65.7)		49 (79.0)	13 (21.0)	
>0.5 a ≤1.0	79 (24.5)	221 (75.5)		112 (62.8)	64 (37.2)	
>1.0 a ≤1.5	17 (24.8)	45 (75.2)		38 (82.8)	13 (17.2)	
>1.5	28 (30.5)	83 (69.5)		62 (62.8)	41 (37.2)	

a) n=624 (60.9%) - corrected by the design effect; b) n=401 (39.1%) - corrected by the design effect; c) Pearson chi-square test.

To be continued

Continuation

Table 2 – Prevalence of abdominal obesity by sex, according to sociodemographic characteristics, health-related behavior and health conditions of the quilombola population (n=1,025), northern Minas Gerais, Brazil, 2019

Characteristics	Female: n (%)[a]		p-value[c]	Male: n (%)[b]		p-value[c]
	Abdominal obesity			Abdominal obesity		
	No	Yes		No	Yes	
Alcohol consumption			0.841			0.597
No	109 (28.0)	279 (72.0)		124 (63.3)	67 (36.7)	
Yes	56 (27.5)	149 (72.5)		140 (71.0)	67 (29.0)	
Smoking			0.011			0.005
Smoker	23 (41.8)	33 (58.2)		73 (86.1)	18 (13.9)	
Former smoker	27 (18.8)	107 (81.2)		99 (62.9)	56 (37.1)	
Never smoked	122 (29.8)	297 (70.2)		88 (60.2)	58 (39.8)	
Consumption of red meat with fat			0.389			0.775
Yes	46 (29.7)	94 (70.3)		108 (64.2)	59 (35.8)	
No	119 (27.3)	324 (72.7)		147 (70.0)	69 (30.0)	
Consumption of chicken with skin			0.018			0.480
Yes	41 (20.5)	157 (79.5)		135 (69.9)	60 (30.1)	
No	119 (30.9)	263 (69.1)		114 (65.9)	66 (34.1)	
Vegetable consumption 5 or more times a week			0.001			0.928
Yes	54 (19.4)	201 (80.6)		78 (63.2)	39 (36.8)	
No	121 (33.5)	244 (66.5)		188 (69.6)	96 (30.4)	
Fruit consumption 5 or more times a week			0.029			0.456
Yes	132 (23.5)	295 (76.5)		219 (67.7)	107 (32.3)	
No	43 (30.4)	149 (69.6)		47 (67.6)	28 (32.4)	
Consumption of sweet food 5 or more times a week			0.003			0.871
No	37 (41.9)	52 (58.1)		32 (69.0)	17 (31.0)	
Yes	138 (26.1)	391 (73.9)		234 (67.4)	118 (32.6)	
Salt intake			0.870			0.458
Very high/High	19 (34.9)	43 (65.1)		35 (70.0)	13 (30.0)	
Adequate	83 (27.0)	209 (73.0)		143 (67.8)	70 (32.2)	
Low/very low	72 (28.3)	191 (71.7)		88 (67.5)	51 (32.5)	
Physical activity (minutes/week)			0.587			0.486
<150	139 (21.6)	355 (78.4)		216 (62.9)	106 (37.1)	
≥150	30 (29.8)	87 (70.2)		48 (68.7)	29 (31.3)	
Self-perceived health			<0.001			0.081
Positive	102 (37.9)	185 (62.1)		150 (73.7)	64 (26.3)	
Negative	72 (19.3)	262 (80.7)		115 (60.4)	71 (39.6)	
Arterial hypertension			<0.001			<0.001
No	134 (39.8)	210 (60.2)		197 (74.7)	69 (25.3)	
Yes	37 (11.7)	226 (88.3)		69 (49.9)	66 (50.1)	

a) n=624 (60.9%) - corrected by the design effect; b) n=401 (39.1%) - corrected by the design effect; c) Pearson chi-square test.

To be continued

Continuation

Table 2 – Prevalence of abdominal obesity by sex, according to sociodemographic characteristics, health-related behavior and health conditions of the quilombola population (n=1,025), northern Minas Gerais, Brazil, 2019

Characteristics	Female: n (%)[a]		p-value[c]	Male: n (%)[b]		p-value[c]
	Abdominal obesity			Abdominal obesity		
	No	Yes		No	Yes	
Diabetes *mellitus*			0.001			0.020
No	167 (30.7)	381 (69.3)		249 (69.1)	117 (30.9)	
Yes	07 (11.2)	59 (88.8)		17 (51.8)	18 (48.2)	
Heart disease			0,057			0,197
No	160 (29.8)	382 (70.2)		249 (68.8)	119 (31.2)	
Yes	14 (13.7)	60 (86.3)		15 (58.2)	12 (41.8)	
Lung disease			0.952			0.190
No	158 (27.5)	423 (72.5)		252 (68.8)	123 (31.2)	
Yes	15 (32.6)	39 (67.4)		13 (48.5)	11 (51.5)	
High cholesterol			<0.001			<0.001
No	154 (33.9)	303 (66.1)		232 (70.3)	97 (29.7)	
Yes	21 (12.3)	140 (87.7)		33 (53.8)	35 (46.2)	
Anemia			0.232			0.054
No	109 (26.5)	299 (73.5)		245 (67.1)	131 (32.9)	
Yes	66 (31.9)	145 (68.1)		21 (76.8)	04 (23.2)	
Chronic kidney disease			0.933			0.270
No	167 (28.7)	423 (71.3)		257 (67.6)	133 (32.4)	
Yes	08 (20.1)	21 (79.9)		09 (68.1)	02 (31.9)	
Depression			0.897			0.065
No	138 (28.4)	355 (71.6)		242 (67.2)	130 (32.8)	
Yes	36 (27.7)	90 (72.3)		23 (72.6)	05 (27.4)	
Cancer			0.201			0.681
No	172 (28.5)	436 (71.5)		254 (67.3)	130 (32.7)	
Yes	01 (2.1)	9 (97.9)		10 (91.1)	04 (8.9)	

a) n=624 (60.9%) - corrected by the design effect; b) n=401 (39.1%) - corrected by the design effect; c) Pearson chi-square test.

Table 3 – Prevalence ratios and 95% confidence interval of abdominal obesity by the independent variables among quilombola women (n=624), northern Minas Gerais, Brazil, 2019

Characteristics	Crude PR[b]		Adjusted PR[b]	
	PR[b] (95% CI)[c]	p-value[a]	PR[b] (95% CI)[c]	p-value[a]
Level 1 – Distal				
Age group (in years)		<0.001		0.010
18-29	1.00		1.00	
30-39	1.36 (1.04;1.79)		1.07 (0.87;1.31)	
40-49	1.45 (1.10;1.91)		1.16 (0.95;1.42)	
50-59	1.69 (1.33;2.17)		1.25 (1.01;1.54)	
60-69	1.63 (1.27;2.09)		1.34 (1.09;1.67)	
≥70	1.39 (1.03;1.89)		1.37 (1.09;1.73)	

a) Wald test; Deviance (statistics): p= 0.361; b) PR: prevalence ratio; c) 95%CI: 95% confidence interval.

To be continued

Continuation

Table 3 – Prevalence ratios and 95% confidence interval of abdominal obesity by the independent variables among quilombola women (n=624), northern Minas Gerais, Brazil, 2019

Characteristics	Crude PR[b]		Adjusted PR[b]	
	PR[b] (95% CI)[C]	p-value[a]	PR[b] (95% CI)[C]	p-value[a]
Level 1 – Distal				
Marital status		0.007		0.007
Married	1.00		1.00	
Separated/divorced/widowed	1.00 (0.86;1.15)		1.06 (0.95;1.16)	
Single	0.73 (0.59;0.89)		0.83 (0.72;0.95)	
Schooling (years of study)		0.004	–	–
Illiterate	1.00			
<8	1.08 (0.92;1.27)		–	–
≥8	0.84 (0.69;1.02)		–	–
Family income (minimum wage)		0.395	–	–
≤0.5	1.00		–	–
>0.5 a ≤1.0	1.15 (0.97;1.36)		–	–
>1.0 a ≤1.5	1.14 (0.91;1.44)		–	–
>1.5	1.06 (0.85;1.32)		–	–
Level 2 – Intermediate				
Smoking		0.025		0.109
Smoker	1.00		1.00	
Former smoker	1.40 (1.03;1.89)		1.26 (1.00;1.58)	
Never smoked	1.21 (0.90;1.62)		1.18 (0.95;1.47)	
Consumption of chicken with skin		0.024		0.048
Yes	1.15 (1.02;1.90)		1.09 (1.00;1.19)	
No	1.00		1.00	
Vegetable consumption 5 or more times a week		0.001	–	–
Yes	1.00		–	–
No	0.83 (0.71;0.93)		–	–
Fruit consumption 5 or more times a week		0.140	–	–
Yes	1.00			
No	0.91 (0.80;1.03)		–	–
Consumption of sweet foods 5 or more times a week		0.041	–	–
No	1.00		–	–
Yes	1.27 (1.01;1.60)		–	–
Leve 3 – Proximal				
Self-perceived health		<0.001	–	–
Positive	1.00		–	–
Negative	1.30 (1.14;1.48)			
Arterial hypertension		<0,001		<0,001
No	1.00		1.00	
Yes	1.47 (1.30;1.65)		1.22 (1.11;1.36)	

a) Wald test; Deviance (statistics): p= 0.361; b) PR: prevalence ratio; c) 95%CI: 95% confidence interval.

To be continued

Continuation

Table 3 – Prevalence ratios and 95% confidence interval of abdominal obesity by the independent variables among quilombola women (n=624), northern Minas Gerais, Brazil, 2019

Characteristics	Crude PR[b]		Adjusted PR[b]	
	PR[b] (95%CI)[c]	p-value[a]	PR[b] (95%CI)[c]	p-value[a]
Leve 3 – Proximal				
Diabetes *mellitus*		<0.001	–	–
No	1.00		–	–
Yes	1.28 (1.13;1.45)		–	–
Heart disease		0.002	–	–
No	1.00			
Yes	1.23 (1.08;1.40)		–	–
High cholesterol		<0.001	–	–
No	1.00		–	–
Yes	1.33 (1.19;1.48)		–	–
Anemia		0.273		
No	1.00		–	–
Yes	0.93 (0.81;1.06)		–	–
Cancer		<0.001	–	–
No	1.00		–	–
Yes	1.37 (1.27;1.50)		–	–

a) Wald test; Deviance (statistics): p= 0.361; b) PR: prevalence ratio; c) 95%CI: 95% confidence interval.

Table 4 – Prevalence ratios and 95% confidence interval of abdominal obesity by the independent variables among quilombola men (n=401), northern Minas Gerais, Brazil, 2019

Characteristics	Crude PR[b]		Adjusted PR[b]	
	PR[b] (95%CI)[c]	p-value[a]	PR[b] (95%CI)[c]	p-value[a]
Level 1 – Distal				
Age group (in years)		0.201		0.003
18-29	1.00		1.00	
30-39	1.19 (0.42;3.32)		1.35 (0.70;2.60)	
40-49	2.29 (0.93;5.61)		1.60 (0.85;3.01)	
50-59	2.07 (0.87;4.95)		1.68 (0.91;3.14)	
60-69	2.42 (1.02;5.74)		2.52 (1.33;4.75)	
≥70	2,27 (0,97;5,59)		2.44 (1.24;4.81)	
Marital status		<0.001		0.057
Married	1.00		1.00	
Separated/divorced/widowed	1.12 (0.72;1.73)		0.96 (0.72;1.28)	
Single	0.30 (0.16;0.56)		0.63 (0.43;0.92)	
Family income (minimum wage)		0.080	–	–-
≤0.5	1.00		–	–
>0.5 a ≤1.0	1.78(0.93;3.34)		–	–
>1 a ≤1.5	0.81 (0.32;2.07)		–	–
>1.5			–	–

a) Wald test; Deviance (statistics): p= 0.487; b) PR: prevalence ratios; c) 95%CI: 95% confidence interval.

To be continued

Continuation

Table 4 – Prevalence ratios and 95% confidence interval of abdominal obesity by the independent variables among quilombola men (n=401), northern Minas Gerais, Brazil, 2019

Characteristics	Crude PR[b]		Adjusted PR[b]	
	PR[b] (95%CI)[c]	p-value[a]	PR[b] (95%CI)[c]	p-value[a]
Level 2 – Intermediate				
Smoking		0.007		0.002
Smoker	1.00		1.0	
Former smoker	2.67 (1.37;5.20)		1.15 (0.78;1.68)	
Never smoked	2.86 (1.48;5.52)		1.73 (1.17;2.55)	
Level 3 – Proximal				
Self-perceived health		0.026	–	–
Positive	1.00		–	–
Negative	1.51 (1.05;2.17)		–	–
Arterial hypertension		<0.001		0.005
No	1.00		1.00	
Yes	1.98 (1.41;2.79)		1.42 (1.11;1.80)	
Diabetes *mellitus*		0.070	–	–
No	1.00		–	–
Yes	1.56(0.96;2.52)		–	–
Heart disease		0.350	–	–
No	1.00		–	–
Yes	1.34 (0.73;2.48)		–	–
Lung disease		0.077	–	–
No	1.00		–	–
Yes	1.65 (0.95;2.87)		–	–
High cholesterol		0.036	–	–
No	1.00		–	–
Yes	1.55(1.03;2.34)		–	–
Anemia		0.515	–	–
No	1.00		–	–
Yes	0,71 (0,25;2,01)		–	–
Depression		0.690	–	–
No	1.00		–	–
Yes	0.84 (0.35;2.02)		–	–

a) Wald test; Deviance (statistics): p= 0.487; b) PR: prevalence ratios; c) 95%CI: 95% confidence interval.

Abdominal adiposity was significantly associated with advancing age. The changes inherent to the aging process – for example, hormonal changes, basal metabolic rate and level of physical activity – cause changes in body composition that may favor fat accumulation.[21] However, as observed in this study, it is important to highlight a linear trend decline in abdominal obesity in the elderly, possibly explained by the decrease in body weight among this age group due to reduced number of teeth and chewing difficulty, attributed to lesions in the oral cavity, use of dental prostheses or gastrointestinal disorders.[21]

It could be seen that men present higher risk behaviors for the onset of abdominal obesity and NCDs, such as the consumption of meat with fat, irregular consumption of vegetables and fruits per week, and physical activity less

than 150 minutes per week. Other authors have also observed such behaviors among males in quilombola communities in the northern Minas Gerais.[23]

With regard to the intake of sweet foods (e.g., cakes, candies and biscuits) during the week, it could be seen that it was more frequent than the intake of fruits and vegetables in the same period, in both sexes. Poverty among quilombolas favors access to industrialized foods, poor in nutritional value and highly energetic, but that are low in price.[24] It is noteworthy that the poor eating habits identified, reflect the social invisibility that quilombola communities are subjected to, without guarantee of financial support for their crop maintenance, which would certainly contribute to the adoption of a healthier diet.[23]

A high prevalence of quilombolas living a sedentary lifestyle and who are insufficiently physically active was found. Although other studies have showed an association between physical inactivity and increased abdominal obesity,[6.25] this study do not corroborate this finding. A study addressing black Africans did not find an association between physical inactivity and indicators of body fat, either in men or women.[20]

Smokers presented a lower prevalence of abdominal obesity. In fact, studies have shown that smokers tend to have lower body weight when compared to non-smokers and former smokers.[6.11.20.25] Nicotine increases the levels of the neurotransmitters, dopamine and serotonin, reducing appetite and energy need, in addition to exerting a direct effect on adipose tissue metabolism. On the contrary, smoking cessation can cause weight gain of 5 to 6 kilograms, being more prevalent in famales.[26]

There was a significant association between abdominal obesity and hypertension in men and women. A cross-sectional study conducted in 2010 with adults from São Francisco do Conde, state of Bahia, also observed a higher prevalence of abdominal adiposity in both sexes when they reported a diagnosis of hypertension.[11] Waist circumference proved to be an independent predictor of hypertension, according to a study conducted with 2,726 young adults from Sub-Saharan Africa between 2009 and 2012. The same African study observed that each 1cm increase in waist circumference was associated with 9% increase in the prevalence of hypertension.[27]

The results of the study showed that abdominal obesity is an important health problem in quilombola communities in the north of Minas Gerais State that were analyzed here. These data, aggravated by the high prevalence of chronic diseases and historical vulnerability to which the quilombolas are subjected, points to the opportunity to conduct further studies and reflections on development and strengthening of public policies aimed at this population group.

Authors' contributions

Queiroz PSF collaborated with the conception of the study, data analysis and interpretation and design of the first version of the manuscript. Miranda LP, Oliveira PSD, Rodrigues Neto JF, Sampaio CA, Oliveira TL and Silva MLO collaborated with the conception of the study, data analysis and interpretation and critical reviewing of the manuscript. 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.

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