Prevalence of overweight and obesity and increased risk for cardiovascular disease and associated factors in farming families in southern Brazil

Prevalência de sobrepeso e obesidade e risco aumentado para doenças cardiovasculares e fatores associados em agricultores familiares do sul do Brasil

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ABSTRACT
The objective was to measure the prevalence of overweight and obesity (OO) and very high risk for cardiovascular diseases (CVD), and associated factors, in farmers and their families in a city in southern Brazil Observational, cross-sectional study carried out with farmers and their families residing in the Serra Gaúcha region. For data collection, a wide questionnaire was used, in addition to anthropometric measurements (Body Mass Index - BMI and waist circumference). Associations with outcomes were explored using Student's t-tests and ANOVA to compare means and the chi-square test for categorical variables. 122 individuals participated in this study. Prevalence of OO was 59.0% and very high risk for CVD was 50.8%, being present in 78.7% of women and in 33.3% of men. Annual income and very high risk for CVD were identified as factors associated with OO. Also, factors associated with a very high risk for CVD were advanced age and BMI in both sexes, and marital status in men. Thus, the importance of early identification of risk factors for outcomes in farmers and their families is reinforced, in view of high prevalence's observed.

Keywords: agricultural workers, Brazil, cardiovascular diseases, epidemiology, nutrition status.

RESUMO
Objetivou-se medir a prevalência de sobrepeso e obesidade (OO) e risco muito alto para doenças cardiovasculares (DCV) e fatores associados, em agricultores e suas famílias em uma cidade do sul do Brasil. Estudo observacional, transversal, realizado com agricultores e suas famílias residentes na região da Serra Gaúcha. Utilizou-se um questionário amplo, além de medidas antropométricas (Índice de Massa Corporal - IMC e circunferência da cintura). As associações com os resultados foram exploradas usando os testes t de Student e ANOVA para comparar as médias e o teste do qui-quadrado para variáveis categóricas. 122 indivíduos participaram deste estudo. A prevalência de OO foi de 59,0% e o risco muito alto para DCV foi de 50,8%, estando presente em 78,7% das mulheres e em 33,3% dos homens. Renda anual e risco muito alto para DCV foram identificados como fatores associados à OO. Além disso, fatores associados ao risco muito alto para DCV foram idade avançada e IMC em ambos os sexos e estado civil nos homens. Assim, reforça-se à importância da identificação precoce de fatores de risco para desfechos em agricultores e suas famílias, tendo em vista as altas prevalências observadas.

Palavras-chave: agricultores, Brasil, doenças cardiovasculares, epidemiologia, estado nutricional.

1 INTRODUCTION

Overweight and obesity are defined as accumulation of too much fat that presents a health risk. This process occurs due to an energy imbalance between calories consumed and calories spent, caused mainly by the increase in industrialized foods consumed with many calories, and at the same time, by the increase in physical inactivity, and increasingly sedentary nature of the population[(1)]. In addition, it is known numerous

factors that corroborate this imbalance, since its appearance is influenced by genetic, metabolic, environmental and behavioral factors[2].

Since 1975 years, obesity prevalence has practically tripled in world. Thus, most people live in countries where overweight and obesity kill more than underweight. In 2016, 1.9 billion adults were overweight, of which 650 million were obese. Thus, overweight and obesity have come to be considered a public health problem, with high prevalence in majority of countries[1]. In Brazil, data from Vigitel (2018) indicated 55.7% overweight prevalence and 19.8% obesity, in adult population[3].

Along with overweight and obesity increases, cardiovascular diseases (CVD) have also increased over the years[4]. CVD has been the leading cause of death worldwide and, in 2019, approximately 17.9 million people died from CVD. The reduction of deaths from chronic non-communicable diseases, such as CVD, is among the goals of the World Health Organization, and should be achieved by 2025[5]. In addition, it's known that, today, one in ten people presents high risk for CVD[6]. Worrying facts, once most CVDs can be prevented through behavioral changes and application of healthy lifestyle habits[2,4].

The risk for CVD can be identified by several methods, including waist circumference (WC). It is an anthropometric measure of easy measurement and low cost, being able to reflect abdominal and visceral adiposity excess, which are often associated with several metabolic and cardiovascular disorders[2,7]. Thus, it refers to a reliable method to identify the increased risk for CVD[8]. To identify an increased risk of CVD, it is suggested to use values greater than 102 cm for men and 88 cm for women[2,9].

Overweight and obesity (OO) presence has been associated with age, income, psychological stress, sedentary lifestyle and chronic non-communicable diseases, such as diabetes, hypertension and cancer[1,2,10–13]. Therefore, the very high risk for CVD is associated with advanced age, sedentary lifestyle, diabetes, hypertension, hypercholesterolemia, weight excess and body fat[8,11,14]. In addition, high WC values increases multimorbidity's chances more than twice[15].

Recent studies point out the importance of attempting farmers health, once they have high mortality rates due to various diseases, as well as the high prevalence of health risk factors, such as smoking, alcoholism, physical inactivity and obesity[16–19], which are behaviors commonly associated with OO, as well as CVD[2,6]. Thus, the present study

aimed to verify the prevalence of OO and increased risk for CVD, as well as associated factors, in farmers and their families in a city in Serra Gaúcha region.

2 METHODS

2.1 STUDY DESIGN AND POPULATION

The study was carried out with the sample of people who participated in our previous research[20,21], being farmers and family members living in a city in southern Brazil. Of the 275 participants in the previous study, 50 men with at least one year of agricultural work experience were randomly selected and informed about the current research. The 50 individuals and their families over 18 years of age and residents in the rural area were invited, totaling 132 individuals, of whom 122 (92%) were able to participate.

From this, an observational epidemiological study was carried out with a cross-sectional design with the agricultural population of Farroupilha, a small municipality in the Serra Gaúcha region in southern Brazil.

2.2 SAMPLE CHARACTERISTICS

All participants were residents of small farms (<10 hectares). Farmers and their families, of both sexes, aged between 18 and 69 years old, living in rural areas and who had worked in family farming for at least one year and who agreed to participate spontaneously in the research were included.

Farmers and their families who did not have physical and/or cognitive conditions to answer the standardized questionnaire and those who were temporarily unable to participate in data collection were excluded.

2.3 ETHICAL APPROVAL

The study protocol was submitted to the Brazilian Research Ethical Committee (Plataforma Brasil) and approved by the Ethics Committee of the Centro Universitario da Serra Gaúcha (FSG) in February 2017 (registration no. 1.914.198). Subjects gave informed consent prior to participation in the study.

2.4 INSTRUMENTS AND PROCEDURES FOR DATA COLLECTION

For data collection, visits were made to farmers and their families, from July to August 2017, in order to apply the questionnaire and perform anthropometric measurements. Three trained researchers conducted the collection of information at the participants' homes individually for the privacy of the individuals.

The instrument used for data collection was structured and developed by the researchers, which was validated through a pilot study and applied by three trained interviewers. The questionnaire includes questions that made it possible to measure demographic, socioeconomic, lifestyle, dietary, nutritional and health variables.

Regarding socioeconomic and demographic variables, the following were investigated: age (continuous and categorized as 18–35, 36–54 and ≥ 55 years); sex (male/female); marital status (married/single/other); education (continuous and grouped in < 8 and ≥ 8 years); and annual family income (continuous and categorized in ≤ 70, 71–120 and > 120 thousand reais).

As for lifestyle variables and presence of morbidities were included physical activity (yes/no), arterial hypertension (yes/no), hypercholesterolemia (yes/no), diabetes (yes/no) and alcohol consumption (yes/no). Regarding food consumption, fish consumption, dairy products, cheeses, red meat and poultry, grains, cooked and raw vegetables, fruits, eggs and pasta (> 1x per week and never/1x per week) was investigated.

Regarding anthropometric and nutritional status variables, BMI and WC were investigated. At the visit, participants were instructed to wear light clothing to ensure the correct measurement of anthropometric measurements. The body mass (weight) of each individual was verified using a digital scale and height through a stadiometer. Subsequently, BMI was identified, calculating the division of body mass (weight) in kilogram (kg) by height in meters (m) squared (weight/height²). For categorization, it was considered: low weight when BMI values < 18.5 Kg/m² for adults and < 22.0 Kg/m² for elderly (≥ 60 years); eutrophic or normal when BMI ≥ 18.5 to 24.9 Kg/m² for adults and 22.0 to 27.0 Kg/m² for the elderly[22,23]; OO when BMI ≥ 25.0 Kg/m² for adults[24] and > 27.0 Kg/m² for elderly[22]. Subsequently it was classified as: presence of overweight/obesity (OO); absence of OO[24,25].

To measure WC, a measuring tape was used, measuring WC at the midpoint between lower edge of the last rib and upper edge of iliac crest[26]. In order to assume the risk for CVD, values of ≥ 102 cm for men and ≥ 88 cm for women[2,9] were considered,

thus categorizing WC without risk for CVD and increased risk for CVD[9,26]. The same cutoff point for WC was used to identify abdominal obesity (yes/no)[9].

2.5 STATISTICAL ANALYSIS

Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS), version 18.0. Continuous variables were described using mean and standard deviation, and categorical variables by gross and relative frequency. The Shapiro Wilk test was used to check normality of the distribution of continuous variables. Bivariate analyzes were performed using Student's t test and analysis of variance (ANOVA) to compare means, and Chi-square test to identify an association between categorical variables and the outcome. A significance level of 5% ($p<0.05$) was considered for all analyzes.

3 RESULTS

Participated in this study 122 farmers and their families. Regarding OO, a prevalence of 59.0% was identified and WC an overall average of 97.33 cm (standard deviation (SD) ±11.83) was observed, being 97.87 cm (SD±13.27) among women and 96.99 cm (SD±10.91) among men. Therefore, a prevalence of 50.8% of increased risk for CVD was identified, and abdominal obesity was present in 78.7% of women and in 33.3% of men (data not shown in tables).

Regarding socioeconomic and demographic variables, the average age was 45.63 years (SD±14.33), being 43.57 years (SD±15.44) among men and 48.91 years (SD±11.78) years among women (data not shown in tables). Still on age, 34.4% reported age between 36 and 54 years and 32.8% were between 18 and 35 years old. Sixty-one per cent were male and 38.5% female. Most participants were married or in a stable relationship (77.0%) and had 8 or more years of study (57.4%). Regard to annual income, only 29.5% of the participants declared received more than 120 thousand reais (Table 1).

Regarding interviewees health, 23.8% declared to be hypertensive, 18.0% had hypercholesterolemia and 3.3% diabetes mellitus. In relation to alcohol consumption 69.7% of individuals reported it. In addition, 63.9% of the participants did not practice physical exercises (Table 1).

Table 1 also shows socioeconomic and demographic variables related to presence of morbidities and lifestyle, in relation to the mean BMI and OO. Thus, it was observed

that 72.5% of individuals aged 55 years or older had OO. However, only 42.5% of those aged 18 to 35 years had the condition. Thus, an association between age and OO presence was identified, in which older the age, greater OO prevalence (p=0.021).

There was a difference between mean BMI, individuals who reported receiving > 120 thousand reais had a lower mean BMI (24.78±4.29) when compared to those who received between 71 and 120 thousand reais (27.65±5.21) and ≤ 70 thousand reais (27.93±5.52) (p=0.013). Therefore, the annual income remained associated with OO presence, in which interviewees who declared receiving > 120 thousand reais/year had a lower prevalence of OO (41.7%) (p=0.042) (Table 1).

Table 1 - Socioeconomic and demographic characteristics related to presence of morbidities and lifestyle in relation to average Body Mass Index (BMI) and presence of Overweight/Obesity (OO) in rural workers and their families in Farro

Exposure variables	Total n (%)	BMI Mean ± DP	p-valor*	Prevalence of OO n (%)	p-valor**
Age (in years) (Min. 18 - Máx. 71)			0,058		**0.021**
18-35	40 (32.8)	25.29 ± 6.03[a]		17 (42.5)	
36-54	42 (34.4)	27.60 ± 4.94[a]		26 (61.9)	
≥ 55	40 (31.8)	27.77 ± 4.30[a]		29 (72.5)	
Sex			0.214		0.921
Male	75 (61.5)	26.38 ± 4.05[a]		28 (59.8)	
Female	47 (38.5)	27.73 ± 6.64[a]		44 (58.7)	
Marital Status			0.172		0.505
Married/Stable relationshop	94 (77.0)	27.25 ± 5.44[a]		57 (60.6)	
Single or others	28 (23.0)	25.71 ± 4.28[a]		15 (53.6)	
Years of education			0.785		0.625
≥ 8	70 (57.4)	27.01 ± 5.71[a]		40 (57.1)	
< 8	52 (42.6)	26.75 ± 4.52[a]		32 (61.5)	
Annual Income (thousands of Brazil reais)			**0.013**		**0.042**
> 120	36 (29.5)	24.78 ± 4.29[a]		15 (41.7)	
71 a 120	43 (35.2)	27.65 ± 5.21[b]		29 (67.4)	
≤ 70	43 (35.2)	27.93 ± 5.52[b]		28 (65.1)	
Risk for CVD			**≤0.0001**		**≤0.0001**
Without risk	60 (49.2)	23.76 ± 3.04[a]		19 (31.7)	
Very high risk	62 (50.8)	29.94 ± 5.10[b]		53 (85.5)	
Arterial Hypertension			**≤0.001**		0.093
Not	93 (76.2)	26.02 ± 4.51[a]		51 (54.8)	
Yes	29 (23.8)	29.73 ± 6.32[b]		21 (72.4)	
Hypercholesterolemia			0.145		0.060
Not	100 (82.0)	26.58 ± 5.32[a]		55 (55.0)	
Yes	22 (18.0)	28.37 ± 454[a]		17 (77.3)	
Diabetes			0.169		0.509
Not	118 (96.7)	26.78 ± 5.21[a]		69 (58.5)	
Yes	4 (3.3)	30.44 ± 4.72[a]		3 (75.0)	
Alcohol intake			0.342		0.738
Not	37 (30.3)	26.24 ± 4.91[a]		21 (56.8)	
Yes	85 (69.7)	27.19 ± 5.35[a]		51 (60.0)	
Practices physical exercise			0.142		0.711
Not	78 (63.9)	27.39 ± 5.61[a]		47 (60.3)	

Yes	44 (36.1)	26.03 ± 4.38[a]		25 (56.8)

Legend: BMI - Body Mass Index. OO - Overweight/Obesity. ab - different letters express difference between mean and standard deviation values. * Student's t test or ANOVA for independent samples. ** Chi-square test for heterogeneity. p - Index of statistical significance. Values in bold are statistically significant (p<0.05).
upilha, RS, 2017 (n = 122)

As for WC, a higher BMI mean (29.94±5.10) was identified among those at increased risk for CVD (p≤0.0001). Also, there was an association between increased risk for CVD and the presence of OO, in which a higher prevalence of the outcome of OO (85.5%) was observed among participants at risk (p≤0.0001) (Table 1).

Respondents diagnosed with arterial hypertension had a higher mean BMI (29.73± 6.32) when compared to those who did not have the condition (26.02±4.51) (p≤0.001). However, there was no significant association between arterial hypertension and presence of OO (p=0.093), although hypertensive individuals had a higher prevalence of the outcome (72.4%). Regarding other variables in relation to morbidity presence, no significant association or difference with outcomes was identified (Table 1).

Table 2 – Socioeconomic and demographic variables of women related to the presence of morbidities and lifestyle in relation to the average waist circumference and increased risk for cardiovascular diseases (CVD) in rural workers and their families in Farroupilha, RS, 2017 (n=122)

Exposure Variables	**Total n (%)**	**Women (n=47)**				
		n (%)	**WC Mean±DP**	**p-valor***	**Increased risk for CVD n (%)**	**p-valor****
Age in years				0.167		**≤0.001**
18 a 35	40 (32.8)	10 (21.3)	93.10±19.40[a]		4 (40.0)	
36 a 54	42 (34.4)	20 (42.6)	96.35±11.69[a]		16 (80.0)	
≥ 55	40 (31.8)	17 (36.2)	102.47±9.64[a]		17 (100.0)	
Marital Status				0.770		0.598
Married/Stable relationshop	94 (77.0)	44 (93.6)	98.02±13.46[a]		35 (79.5)	
Single or others	28 (23.0)	3 (6.4)	95.67±12.09[a]		2 (66.7)	
Years of education				0.111		0.982
≥ 8 years	70 (57.4)	26 (55.3)	94.43±11.42[a]		21 (80.8)	
< 8 years	52 (42.6)	21 (44.7)	100.65±14.20[a]		16 (76.2)	
Anual income (x 1.000 Brazilian reais)				**0.035**		0.281
> 120	36 (29.5)	14 (29.8)	90.57±10.98[a]		9 (64.3)	
71 - 120	43 (35.2)	15 (31.9)	102.73±14.29[b]		13 (86.7)	
≤ 70	43 (35.2)	18 (38.3)	99.50±12.20[ab]		15 (83.3)	
Arterial hypertension				**0.004**		0.496
Not	93 (76.2)	31 (66.0)	94.00±11.52[a]		23 (74.2)	
Yes	29 (23.8)	16 (34.0)	105.38±13.57[b]		14 (87.5)	
Hypercholesterolemia				0.174		0.071
Not	100 (82.0)	34 (72.3)	96.24±14.17[a]		24 (70.6)	
Yes	22 (18.0)	13 (27.7)	102.15±9.80[a]		13 (100.0)	
Body Mass Index				**≤0.0001**		**≤0.0001**
Eutrophic	50 (41.0)	19 (40.4)	86.21±6.10[a]		9 (47.4)	
OO	72 (59.0)	28 (59.6)	105.79±10.71[b]		28 (100.0)	

Alcohol intake				0.387		0.779
Not	37 (30.3)	23 (48.9)	96.13±9.95[a]		19 (82.6)	
Yes	85 (69.7)	24 (51.1)	99.54±15.87[a]		18 (75.0)	
Regular physical activity				0.081		0.317
Yes	44 (36.1)	15 (31.9)	92.93±12.56[a]		10 (66.7)	
Not	78 (63.9)	32 (68.1)	100.19±13.15[a]		27 (84.4)	

Legend: WC - Waist circumference. BMI - Body Mass Index. ab - different letters express difference between mean and standard deviation values. * Student's t test or ANOVA for independent samples. ** Chi-square test for heterogeneity. p - Index of statistical significance. Values in bold are statistically significant (p<0.05).

Table 2 and 3 shows socioeconomic and demographic variables related to presence of morbidities and lifestyle in relation to the mean WC and increased risk for CVD among women and men. Thus, an association between age and increased risk for CVD was identified, in which, prevalence of the outcome increases with older age, both for women (18 to 35 years – 40.0%; 36 to 54 years – 80.0%; ≥ 55 years – 100.0%) (p≤0.001) (Table 2) and for men (18 to 35 years – 13.3%; 36 to 54 years – 40.9%; ≥ 55 years – 52.2%) (p=0.008) (Table 3). There was also a difference between mean WC in men, in which individuals aged ≥ 55 years (102.00±11.08) and 36 to 54 years (98.95±8.50) had a higher WC average than participants aged 18 to 35 years (91.70±10.32) (p≤0.001) (Table 3).

Table 3 – Socioeconomic and demographic variables of men related to the presence of morbidities and lifestyle in relation to the average waist circumference and increased risk for cardiovascular diseases (CVD) in rural workers and their families in Farroupilha, RS, 2017 (n=122)

Exposure Variables	**Total n (%)**	**Men (n=75)**			
		WC Mean±DP	**p-valor***	**Increased risk for CVD n (%)**	**p-valor****
Age in years			**≤0.001**		**0.008**
18 a 35	40 (32.8)	91.70±10.32[a]		4 (13.3)	
36 a 54	42 (34.4)	98.95±8.50[b]		9 (40.9)	
≥ 55	40 (31.8)	102.00±11.08[b]		12 (52.2)	
Marital Status			**0.014**		**0.046**
Married/Stable relationshop	94 (77.0)	99.16±10.39[a]		21 (42.0)	
Single or others	28 (23.0)	92.64±10.82[b]		4 (16.0)	
Years of education			0.228		0.562
≥ 8 years	70 (57.4)	98.81±11.42[a]		13 (29.5)	
< 8 years	52 (42.6)	95.70±11.48[a]		12 (38.7)	
Anual income (x 1.000 Brazilian reais)			0.060		0.148
> 120	36 (29.5)	93.50±8.73[a]		5 (22.7)	
71 - 120	43 (35.2)	96.25±8.86[a]		8 (28.6)	
≤ 70	43 (35.2)	100.88±13.58[a]		12 (48.0)	
Arterial hypertension			**0.011**		0.450
Not	93 (76.2)	95.53±10.10[a]		19 (30.6)	
Yes	29 (23.8)	103.92±12.35[b]		6 (46.2)	
Hypercholesterolemia			0.182		0.706
Not	100 (82.0)	96.36±11.02[a]		21 (31.8)	
Yes	22 (18.0)	101.56±9.32[a]		4 (44.4)	

Body Mass Index			**≤0.0001**		**≤0.0001**
Eutrophic	50 (41.0)	87.71±6.37[a]		0 (0.0)	
OO	72 (59.0)	103.52±8.42[b]		25 (56.8)	
Alcohol intake			0.539		0.917
Not	37 (30.3)	95.36±9.70[a]		4 (28.6)	
Yes	85 (69.7)	97.36±11.21[a]		21 (34.4)	
Regular physical activity			0.110		0.111
Yes	44 (36.1)	94.45±9.81[a]		6 (20.7)	
Not	78 (63.9)	98.59±11.36[a]		19 (41.3)	

Legend: WC - Waist circumference. BMI - Body Mass Index. ab - different letters express difference between mean and standard deviation values. * Student's t test or ANOVA for independent samples. ** Chi-square test for heterogeneity. p - Index of statistical significance. Values in bold are statistically significant (p<0.05).

Regarding marital status, an association was identified with increased risk for CVD in men, in which there was a higher outcome prevalence among married men or in a stable relationship (42.0%) (p=0.046). Reinforcing these findings, we are founding a higher mean WC in married or in a stable group (99.16±10.39 vs. 92.64±10.82) (p=0.014) (Table 3). In addition, there was a difference between WC mean in relation to annual income of women, in which those who reported an annual income of 71 to 120 thousand reais had a higher average (102.73±14.29) compared to those who reported receiving > 120 thousand reais (90.57±10.98) (p=0.035) (Table 2). However, there was no significant association between annual income and increased risk for CVD in women (p=0.281) (Table 2) or in men (p=0.148) (Table 3).

Regarding morbidities presence, a higher mean WC was observed in hypertensive people, both in women (105.38±13.57 vs. 94.00±11.52) (p=0.004) (Table 2) and in men (103.92±12.35 vs. 95.53±10.10) (p=0.011) (Table 3). Therefore, it was found that individuals with OO had a higher mean WC (Women: 105.79±10.71 vs. 86.21±6.10, p≤0.0001 (Table 2); Men: 103.52±8.42 vs 87.71±6.37, p≤0.0001 (Table 3)). Thus, an association was identified between BMI and increased risk for CVD, with a higher prevalence of outcome for women (100.0%) (Table 2) and men (56.8%) (Table 3) classified with OO (p≤0.0001).

4 DISCUSSION

The present study aimed to verify the prevalence of OO and the increased risk for CVD, as well as associated factors, in farmers and their families in a city in Serra Gaúcha, in which a 59% OO prevalence was found and 50.8% increased risk for CVD. The prevalence identified in this study may represent an alert for this population health.

In comparison with prevalence found internationally, it's necessary to attempt to farmers health and their families. According to a study carried out in Colorado, OO prevalence in rural workers is 14.5%, reaching 34.4% in migrant and seasonal rural workers[27]. In China, in a study carried out in a cohort of farmers and migrants, the overall prevalence of OO increased from 27.9% to 33.6% over an eight-year period[13]. These findings are lower than those identified in this study. However, when analyzing data corresponding to rural population, in United States, prevalence of OO ranges from 71% to 82.5%[28–30], and in Ireland, the prevalence is around 86%[31], both higher than those identified in the present study (59%). In Brazil, the prevalence of OO is above 50%[14,32], like results of this study. Thus, it is identified that prevalence varies according to investigated population, however, there is a high prevalence of OO in studied farmers, reinforcing the need to study and address this population health.

Regarding the prevalence of increased risk for CVD, the present study found a general prevalence of 50.8%, 78.7% in women and 33.3% in men. In international level, prevalence ranges from 38% to 46%[33,34]. In Ireland, 80% of investigated farmers exceeded the recommended WC measures and 38% of participants were at high risk for CVD[31,34]. In addition, the study also shows that 83% of participants had changes in four or more CVD risk markers[31]. In a population-based survey in Europe, elevated WC was identified in 54.6% of women and in 35.8% of men[11], representing an increased risk for CVD, corroborating with our findings.

Observing national context, in a study conducted with farmers in 8 cities in Rio Grande do Sul, 41.8% of men and 18.6% of women were at risk (intermediate and high) for CVD[35], which proved contrary to those identified in present study, once we can observe a higher prevalence among women. In Northeast of Brazil, prevalence of very high risk for CVD in rural population was 40.0%, highlighting it was only present in adult women[14]. In addition, reinforcing present study findings, according to Batista (2015)[32], in a survey conducted with farmers in Minas Gerais, a very high risk for CVD was identified in 44.83% of individuals, being more prevalent among women (73.7%). Thus, comparing to literature findings, there is a high prevalence of increased risk for CVD in the interviewees, which is often higher among women. It's suggested that high prevalence identified have an influence on cultural aspects and lifestyle habits of the investigated population, being more frequent in women. Therefore, it is believed that results found in this study serve as an alert for screening and preventive measures for CVD in farmers.

In our study, a higher mean BMI was identified in participants with an increased risk for CVD, as well as an association with OO. Therefore, a higher mean of WC was observed in participants with OO in both genders, as well as associations between outcomes was maintained. Corroborating our findings, according to a study carried out with adults in the city of Pelotas/RS, of the individuals investigated, 15.7% of overweight men and 85.8% of those with obesity, as well as 46.6% of overweight women and 93.7% of those with obesity were at increased risk for CVD[36]. Consequently, individuals with low and normal weight have a lower CVD risk (57.4%)[8]. Still reinforcing our results, overweight and obese women had, respectively, a 14.7% and 25.0% higher prevalence of risk than those classified with normal BMI[37]. Thus, there is a strong association between outcomes, based on data from literature reinforcing the existence of a positive correlation between CVD risk and BMI, as well as, an association between all risk factors for CVD with the abnormal increase in BMI[11,29].

According to a study, increase in body weight may be associated with older age[35]. In this research, a positive association was observed between age and OO. According Wang et al., (2018)[13] findings, there is a significant increase in overweight and obesity in women, from 30 to 59 years old and from 30 to 49 years old, respectively. In men, overweight occurs more frequently in those aged 20 to 59 years and obesity in those aged 20 to 49 years. Present study findings corroborate the data in literature, in which, in adults, weight gain occurs along with age, and consequently, the BMI increase.

In the present study, farmers with higher income had a lower BMI, as well as a lower prevalence of OO. According to Little et al., (2016)[38], in a study conducted with 752 individuals, a positive linear association was identified between BMI and economic condition. Still, studies have identified high income as a risk factor and a greater chance for OO[10,12], therefore, low income was associated with low weight or malnutrition[12]. These findings are contrary to those observed in this study. Thus, it is believed that higher income among our participants is possibly influencing access to information on healthy eating, acting as a protective factor for OO.

Arterial hypertension is considered one of classic risk factors for CVD[39]. In our results, a higher mean BMI was observed in hypertensive individuals. Also, there was a higher prevalence of OO among hypertensive patients (72.4% vs. 54.8%), although it did not present statistical significance. However, in a survey conducted with 11 population-based epidemiological studies, which 28.887 individuals, an association between

overweight and hypertension was identified[11]. In a cohort of 3.131 workers and 3.493 farmers, with a 10-year follow-up, increasing in BMI was directly associated with increase in hypertension, for both sexes[40]. Thus, literature strengthens findings that demonstrate high BMI among hypertensive patients. It is believed that there is a tendency to increase BMI in farmers with hypertension, as it is already known that obesity is one of reversible risk factors for development of hypertension[39].

In this study, the increased risk for CVD increased with age, both in women and men. Reinforcing these findings, according to Pohl (2018)[35], most participants at very high risk for CVD (43.8%) were aged ≥ 60 years. Still, according to Mendes, Alberto and Rocha (2019)[14], high risk for CVD was present in 20.0% of adults investigated but reaching 75.0% in elderly. According to Luz (2018)[8], being 41 to 50 years old increased the chance of having two or more risk factors for CVD by 3.51 times, and those aged 50 years or more had a chance increased by 5.60 times. Also corroborating with our findings, research's has identified a positive correlation between risk for CVD and age[29]. Thus, as the increase in body weight, risk for CVD also increases with high age, due to physiological dysfunctions that occurs over time[35].

Marital status had an influence on the mean WC in men, therefore, it was associated with an increased risk for CVD, in which it was identified as a risk factor being married or in a stable relationship. In a prospective population-based cohort study, significantly higher risk rates of all-cause mortality were found in single, divorced and widowed men[41]. Still, according to a study, being married acts as a protective factor in relation to risk for CVD[42]. Thus, it is believed that marital status influences CVD risk, requiring further studies to clarify this association.

We found a difference between mean WC in relation to annual income in women. Thus, this difference allows us to observe a higher WC mean in those with annual income of 71 to 120 thousand reais, differentiating only from lowest average of WC, observed in those who reported receiving > 120 thousand reais. However, there was no difference between means of those who reported higher and lower income. According to a study, individuals with low income are most susceptible to have poor cardiovascular health. However, the same study states that low income is often associated with worse health conditions but admits not finding evidences that low income was associated with poor cardiovascular health, after considering other risks factors[43]. In this way, it is believed

that our findings could be better explained if carried out in a population-based survey and random sampling.

According to Ma, Tan and Zhu (2017)[44], elevated WC proved to be a predictor for prehypertension. In this study, a higher WC was identified among hypertensive patients, in both sexes. Corroborating our findings, according to Sebati et al., (2019)[45], in their study, WC showed a positive linear association with blood pressure, therefore, high WC increased the risk of developing hypertension in 2 times. Thus, it is believed that elevated WC is a predictor of hypertension in farmers, as well as of CVD and, consequently, of metabolic diseases.

In case of a cross-sectional study, the reverse causality bias stands out as a limitation, since this design does not allow verifying other facts that may have influenced the results. Another limiting factor was the non-evaluation of other methods for checking intra visceral fat. Also, homogeneity of the sample stands out as a limitation, being composed for farmers and their families only from a single city in Serra Gaúcha, and the probable memory bias, due to the long data collection instrument that may confuse the interviewees. In general, national research's that verifies the association between health risk factors with OO and with the increased risk for CVD in this population is limited.

However, the diversity of data collected is emphasized, reaching a large amount of relevant information to the study. In addition, the care with data manipulation is highlighted, reducing possible typing errors. Questionnaires were applied by a properly trained research team, increasing the veracity of data collected, as well as the results referred in this study.

It is concluded that, among investigates, a high prevalence of OO was identified - a similar result with national scenario - associated with age, annual income and very high risk for CVD. There was also a high prevalence of very high risk for CVD, being higher among women. Very high risk for CVD was associated, in women with age and BMI, and in men with age, marital status and BMI. Thus, the importance of early identification of risk factors for outcomes in farmers and their families is reinforced, in view of a high prevalence of risk for CVD and OO. In addition, the importance of strategies aimed at farmers health is perceived, with an emphasis on prevention, instructing healthy lifestyle habits and promoting quality of life for this population.

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