RESEARCH

PREVALENCE AND CLUSTERING OF CARDIOMETABOLIC RISK FACTORS IN THE ELDERLY POPULATION LIVING IN RURAL AREAS

PREVALÊNCIA E AGLOMERAÇÃO DE FATORES DE RISCO CARDIOMETABÓLICOS EM POPULAÇÃO IDOSA RESIDENTE EM ÁREA RURAL

PREVALENCIA Y AGLOMERACIÓN DE FACTORES DE RIESGO CARDIOMETABÓLICOS EN LA POBLACIÓN RURAL DE EDAD AVANZADA

Alexandra Dias Moreira [1]
Crizian Saar Gomes [2]
Mariana Santos Felisbino-Mendes [3]
Flávia Sampaio Latini Gomes [4]
Jorge Gustavo Velásquez Meléndez [5]

[1] RN. Doctoral student in Nursing and Health at the Nursing School from Universidade Federal de Minas Gerais – UFMG. Belo Horizonte, MG – Brazil.
[2] Nutritionist. Master´s student in Nursing and Health at the Nursing School from UFMG. Belo Horizonte, MG – Brazil.
[3] RN. PhD in Nursing and Health. Professor at the Department of Maternal and Child Nursing and Public Health at the Nursing School of UFMG. Belo Horizonte, MG – Brazil.
[4] RN. PhD in Nursing and Health. Professor at the Basic Nursing Department from the Nursing School of UFMG. Belo Horizonte, MG – Brazil.
[5] Biologist. PhD in Public Health. Full Professor at the Department of Maternal and Child Nursing and Public Health at the Nursing School of UFMG. Belo Horizonte, MG – Brazil.

Corresponding Author: Jorge Gustavo Velásquez Meléndez. E-mail: jguveme@gmail.com
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ABSTRACT

This study assessed the prevalence and clustering of risk factors for cardiovascular diseases in the elderly population of rural areas. This cross-sectional study was performed with 236 individuals, aged between 60 and 99 years, residents in a rural area. The factors analyzed were: overweight (BMI ≥ 27 kg/m²), abdominal obesity (waist circumference ≥ 88 cm for women and ≥ 102 for men), total cholesterol ≥ 200 mg/dL, triglycerides ≥ 150 mg/dL, LDL cholesterol ≥ 160 mg/dL, HDL cholesterol ≤ 40 mg/dL for men and ≤ 50 mg/dL for women, blood glucose ≥ 100 mg/dL, systolic/diastolic blood pressure ≥ 140/90 mmHg, smoking, metabolic syndrome defined according to criteria from the *National Cholesterol Education Program*, and bad diet score. Ratios of prevalence (PR) and 95% confidence intervals (IC95%) were calculated according to sex. Agglomeration of four or more risk factors was observed in 47.4% of the population. Women showed high prevalence of overweight (PR = 1.9; IC95% = 1.05-3.61), abdominal obesity (PR = 3.1; IC95% = 1.80-5.50), increased LDL cholesterol (PR = 2.4; IC95% = 1.31-4.21), metabolic syndrome (PR = 2.2; IC95% = 1.25 -3.84), hypercholesterolemia (PR = 1.3; IC95% = 1.06-1.68), and dyslipidemia (PR = 1.1; IC95% = 1.01-1.29) when compared to men. This study confirms the high prevalence of cardiovascular risk factors in the elderly population and the need for effective public policies for prevention, aiming at healthy aging.

Keywords: Cardiovascular Diseases; Aged; Rural Population; Health of the Elderly.

RESUMO

Com este artigo objetivou-se avaliar a prevalência e aglomeração dos fatores de risco para doenças cardiovasculares em população idosa da área rural. Foi realizado estudo transversal com 236 indivíduos, com idade entre 60 e 99 anos, residentes em área rural. Os fatores analisados foram: excesso de peso (IMC ≥ 27 kg/m²), obesidade abdominal (circunferência da cintura ≥ 88 cm para as mulheres e ≥ 102 para os homens), colesterol total ≥ 200 mg/dL, triglicerídeos ≥ 150 mg/dL, colesterol LDL ≥ 160 mg/dL, colesterol HDL ≤ 40 mg/dL para homens e ≤ 50 mg/dL para mulheres, glicemia ≥ 100 mg/dL, pressão arterial sistólica/diastólica > 140/90 mmHg, tabagismo, síndrome metabólica definida de acordo com critérios do National Cholesterol Education Program e escore de dieta ruim. Razões de prevalência (RP) e intervalos de confiança de 95% (IC95%) foram calculados segundo sexo. Foi encontrada aglomeração de quatro ou mais fatores de risco em 47,4% da população. As mulheres apresentaram alta prevalência de excesso de peso (RP = 1,9; IC95% = 1,05-3,61), obesidade abdominal (RP = 3,1; IC95% = 1,80-5,50), colesterol LDL aumentado (RP = 2,4; IC95% = 1,31-4,21), síndrome metabólica (RP = 2,2; IC95% = 1,25-3,84), hipercolesterolemia (RP = 1,3; IC95% = 1,06-1,68) e dislipidemia (RP = 1,1; IC95% = 1,01-1,29) quando comparadas aos homens. Este estudo confirma a alta prevalência de fatores de risco cardiovasculares na população idosa e a necessidade de políticas públicas efetivas de prevenção de doenças, objetivando envelhecimento saudável.

***Palavras-chave:** Doenças Cardiovasculares; Idoso; População Rural; Saúde do Idoso.*

RESUMEN

Este artículo estima la prevalencia y aglomeración de factores de riesgo cardiovascular entre la población anciana de una zona rural. Estudio transversal realizado con 236 individuos entre 60 y 99 años. Los factores estudiados fueron (IMC≥27kg/m²), obesidad abdominal (circunferencia de cintura ≥88cm para las mujeres y ≥102 para los hombres), colesterol total ≥200mg/dl, triglicéridos ≥150mg/dl, colesterol LDL ≥160mg/dl, colesterol HDL≤40 mg/dl para los hombres y ≤50mg/dl para las mujeres, glucosa en ayunas ≥100 mg/dl, presión arterial sistólica/diastólica >140/90 mmHg, el *tabaquismo. El síndrome metabólico fue definido de acuerdo con los criterios del National Cholesterol Education Program. Razones de prevalencia (RP) y los intervalos de confianza de 95% (IC95%) se calcularon para cada sexo. Aglomeración de cuatro o más factores de riesgo se encontró en 47,4% de la población. Las mujeres presentaron una mayor prevalencia de sobrepeso (RP =1,9; IC95%=1,05 a 3,61), de obesidad abdominal (RP = 3,1; IC95%=1,80 a 5,50), colesterol- LDL aumentado (RP = 2,4; IC95% = 1.31-4.21), y de síndrome metabólica (PR = 2,2, IC del 95%: 1,25 a 3,84), hipercolesterolemia (PR = 1, 3, IC del 95%: 1,06 a 1,68) y dislipemia (PR =1,1; IC95%=1,01 a 1,29) en comparación con los hombres. El estudio confirma la alta prevalencia de factores de riesgo cardiovascular en la población anciana y la necesidad de implementar políticas públicas de prevención con miras al envejecimiento saludable.*

***Palabras clave**: Enfermedades Cardiovasculares; Anciano; Población Rural; Salud del Anciano.*

INTRODUCTION

Population ageing is a global phenomenon resulting from rapidly changing demographic, epidemiological, and nutritional contexts. Among the demographic changes, the reduction of mortality and fertility indicators stands out, which leads to increased life expectancy[1]. While the increase in longevity in the world is a fact, other situations associated with old age, such as cardiometabolic diseases have emerged. In Brazil, this phenomenon is no different and, in addition to causing significant elevation in the proportion of elderly in the population in recent decades, corresponding to 11% of the population (approximately 19 million people), it has currently increased the prevalence of diseases such as hypertension, diabetes, and cancer among others.[1,2]

The increase in morbidity due to non-communicable chronic diseases (NCDs) has consequences in the health sector because this is a population group with particularities in relation to physiology and functional capacity. Commonly, physiological changes during aging also increase the vulnerability of these individuals to develop diseases and risk factors because there is gradual reduction of active tissues in the body, of the functional reserve, as well as significant modifications in metabolic functions.[3] In addition, among the elderly, these factors and diseases occur simultaneously, worsening the health of these individuals.[4] It has also been demonstrated that the effect of these factors, when concurrent, is much greater than the sum of their individual effects and, generally, they are interrelated.[5]

Chronic diseases resulting from the aging process and unhealthy lifestyles are the main responsible for the high rates of morbidity and mortality, especially among the elderly.[2] Focusing on cardiovascular diseases, we can state that these are the leading causes of death and disability among the elderly.[2] NCDs were identified as the main causes of deaths in developed countries (49%) and in those under development (30%).[6] In Brazil, NCDs are the main source of disease burden; 72% of deaths were attributed to them in 2007.[7]

Despite that the occurrence of these diseases increases with age, it is important to recognize that most of them are preventable. The main risk factors for NCDs are related to life habits, among them, obesity, sedentary life style, inadequate diet, and smoking.[2]

Thus, it is believed that incentives for the promotion of health and maintenance of healthy living habits are essential to reduce the prevalence of risk factors for NCDs and provide quality of life for the elderly. It is known that information about the disease and control strategies allows the development of care and better epidemiological approach in addition to promoting autonomy for the elderly. In this scenario, it is necessary to know the health situation of people 60 years and older and the precursor factors for the development of NCDs, particularly for cardiometabolic diseases.

Furthermore, it is noteworthy that rural populations present health problems in greater proportion and are at disadvantage regarding access, offer, and complexity and quality of health services offered compared to urban populations[8], representing inattention to the health of these populations.

The objectives of the present study were to estimate the prevalence and clustering of risk factors for cardiometabolic diseases and to evaluate its differences across sex categories in the population resident in rural areas.

METHODS

This was a cross-sectional study conducted in 2008 and 2010, in the communities of Virgem das Graças, a rural area in the municipality of Ponto dos Volantes, and Caju and São Pedro de Jequitinhonha, rural areas in the municipality of Jequitinhonha. The studied rural areas are located in a poor region, semi-arid, with emigration, and accessed only by unpaved roads.[9]

This study is part of a larger project called "Evolution of indices of obesity and cardiovascular risk factors and their relationship to life habits in rural area populations of Minas Gerais" initiated in 2007. Based on population census, the population of these communities is estimated in 2,173 individuals. Of these, 1,236 were excluded because of age under 18 years old, or were not found at the time of data collection, or presented health problems that prevented or impeded the procedures of data collection, totaling 937 participants of both sexes, aged 18 years or more. In addition, individuals < 60 years (n = 701) were excluded, totaling a final sample of 236 individuals. It is noteworthy that some individuals did not provide complete data for all variables of interest; however, we opted to not exclude them.

Data were collected by a multidisciplinary team composed mainly of nurses and nutritionists previously trained. Face-to-face interviews were conducted using a structured questionnaire with questions about socioeconomic, demographic, and lifestyle aspects (eating habits, physical activity, and smoking). At the end of the interview, clinical evaluation was performed including anthropometric and blood pressure measurements. Blood samples were collected for biochemical tests (total cholesterol, HDL cholesterol, LDL cholesterol, and glucose). The population was invited to attend the local health basic units for data collection.

The anthropometric measurements were obtained following international recommendations.[10] Weight was measured on a digital scale (model PL 150, Filizzola Ltda,) to the nearest 0.1 kg. Height was measured using a portable stadiometer, brand Alturaexata® (TBW Brazil, Brazil) to the nearest 0.1 cm. Weight and height were used to calculate body mass index (BMI) according to the formula: weight (kg)/height (m)^2. The waist circumference (WC) was measured with the subject standing barefoot with parallel feet and ankles together, using an inelastic tape measure positioned at the midpoint of the bottom of the last coastal arc and the upper part of the anterior-superior iliac crest, to the nearest 0.1 cm. Blood pressure (BP) was determined by an indirect method, using a mercury sphygmomanometer and according to international recommendations.[11] Measurements were taken three times and the final value was determined by their mean.

Approximately 25 mL of blood were collected after 12 hours fasting for biochemical analysis to measure blood glucose, total and fractionated cholesterol, and triglycerides. The collection and centrifugation of blood samples were conducted in the area of research, and carried out, respectively, by nursing and laboratory technicians. Enzymatic colorimetric methods were used with the Analyzer COBAS MIRA PLUS (Roche Diagnostics, Switzerland) to determine the concentrations of total cholesterol (TC), triglycerides (TG), and glucose. The concentration of high-density lipoprotein (HDL-C) was also measured by a colorimetric test after precipitation of low density lipoprotein (LDL-C) and very low-density lipoprotein (VLDL-C) fractions with phosphotungstic acid and magnesium chloride. The LDL-C levels were calculated based on equation: LDL cholesterol = total cholesterol – (HDL cholesterol + TG/5).

The cardiometabolic risk factors used were:

- **overweight**: BMI > 27 kg/m^2.[12]
- **abdominal obesity:** WC ≥ 88 cm for women and ≥ 102 WC for men.[13]
- **hypercholesterolemia:** levels of total cholesterol (TC) ≥ 200 mg/dL.[14]
- **hypertriglyceridemia:** triglycerides (TG) ≥ 150 mg/dL.[14]
- **increased LDL cholesterol:** LDL ≥ 160 mg/dL.[14]
- **low HDL cholesterol:** HDL ≤ 40 mg/dL for men and ≤ 50 mg/dL for women.[14]
- **dyslipidemia:** if the individual presented at least one altered cholesterol or fractions result.[14]
- **hyperglycemia:** blood glucose ≥ 100 mg/dL.[15]
- **hypertension:** systolic/diastolic blood pressure ≥ 140/90 mmHg[14] or reporting use of antihypertensive.
- **tobacco** use (smoker and former smoker).
- **metabolic syndrome:** defined according to the criteria of the *National Cholesterol Education Program* (NCEP)[13] and modified by Grundy.[15]
- **diet score:** defined according to Felisbino-Mendes *et al*.[16]

Additionally, a score of clustering of risk factors was created including the following variables: waist circumference, dyslipidemia, hypertension, hyperglycemia, smoking, and diet. This variable was categorized into less than four factors and four factors or more in the analysis.

Data were processed and analyzed using the statistical software Stata, version 12.0 (*Stata Corp., College Station*, TX, USA). The analysis of cardiometabolic risk factors was performed according to categories of sex and educational level. Non-adjusted and adjusted prevalence ratios (PR) and 95% confidence intervals were calculated using Poisson regression models for each factor. When analyzing across sex, we performed adjustments for age and education; and across educational level categories, we adjusted for age and sex. A chart with the sum of factors was built to evaluate the clustering of risk factors in the same individual, however, it did not include dyslipidemia, metabolic syndrome, and total cholesterol because these were already risk scores on their own. Pearson's Chi-square test at the statistical significance level of 5% was used.

This study was approved by the Research Ethics Committee from the Universidade Federal de Minas Gerais, according to Resolution number 196/1996 from the National Health Council (BRAZIL, 1996), and under opinion ETIC 604/07. All individuals who participated in the study were informed about the objectives of the research and their rights as participants and, voluntarily signed the consent form.

RESULTS

The study population was composed of 236 elderlies, with a mean age of 70.5 years (SD = 8.3). Sex distribution was relatively homogeneous, 53.4% were female. Low education level was observed among the elderly; 54.8% were illiterate, 38.5% studied one to four years, and only 6.7% had five or more years of schooling. The majority of this population was married (63.6%).

The analysis of clustering of cardiometabolic risk factors among the elderly (Figure 1) showed that 47.4% had four or more factors. Table 1 shows this simultaneity according to the socio-demographic variables of sex, age, color, marital status, and education. No significant difference was observed between the evaluated categories.

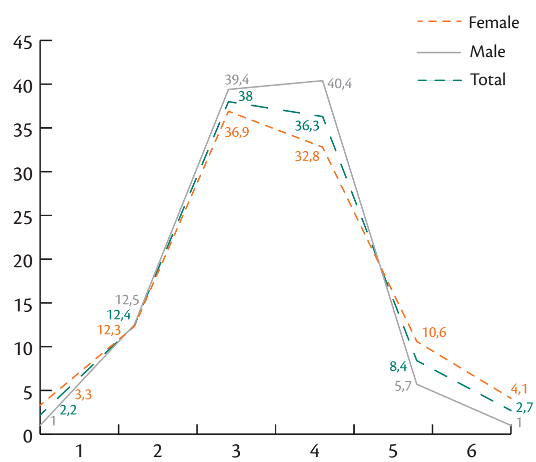

Figure 1 - Distribution of risk factors according to sex.
Source: VDG/CAJU/SPJ, 2008-2010 (ANNEX).

The analysis of all risk factors in the elderly population (data not shown) showed that dyslipidemia was the most frequent cardiometabolic risk factor (86.4%), followed by inadequate diet (85.0%), hypercholesterolemia (67.1%), hypertension (59.3%), and abdominal obesity (31.8%). According to their body mass index, 24.1% were overweight and 11.6%, obese. In relation to smoking habits, 53.8% reported being smokers or ex-smokers.

In addition, the distribution of cardiometabolic risk factors, when assessed separately, was different across sex (Table 2)**.** In the analyses, adjusted for age and education, women showed higher prevalence for overweight (PR = 1.9; 95%CI = 1.05-3.61), abdominal obesity (PR = 3.1; 95%CI = 1.80-5.50), altered LDL cholesterol (PR = 2.4; 95%CI = 1.31-4.21), metabolic syndrome (PR = 2.2; 95%CI = 1.25-3.84), hypercholesterolemia (PR = 1.3; 95%CI = 1.06-1.68), and dyslipidemia (PR = 1.1; 95%CI = 1.01-1.29), when compared to men. Lower prevalence of smoking and former smoking (PR= 0.7; 95%CI = 0.67-0.80) were recorded in women than in men. Initially, women presented higher prevalence of altered HDL cholesterol and lower prevalence of inadequate diet, however, when the analyses were adjusted for age and education, these differences did not remain significant. Prevalence of cardiometabolic risk factors, hypertriglyceridemia, and hypertension were not different between men and women.

Table 1 - Clustering of cardiometabolic risk factors according to socio-demographic variables

Variables	Clustering of factors: Less than 4 factors		More than 4 factors		p-value*
	N	%	N	%	
Sex					
Male	55	52.8	49	47.1	0.949
Female	64	52.5	58	47.5	
Age					
60 to 69 years	66	55.5	53	44.5	0.373
70 years or more	53	49.5	54	50.5	
Color					
White	36	52.9	32	47.1	0.955
Black or brown	83	52.5	75	47.5	
Marital status					
Married or in union	71	49.65	72	50.3	0.204
Single	11	73.3	4	26.7	
Separated, divorced or widowed	37	54.4	31	45.6	
Schooling					
Illiterate	51	54.8	42	45.2	0.671
0 to 4 years of education	33	48.5	35	51.5	
5 years or more of education	7	58.3	5	41.7	

Note: * p-values of Pearson qui-square test.
Source: VDG/Caju/SPJ, 2008-2010.

Table 2 - Distribution, PR, and 95% confidence intervals of cardiometabolic risk factors according to sex in a Brazilian rural population

Overweight (n = 232)			
Sex	n (%)	PRa (95%CI)	PRb (95%CI)
Male	15 (13.9)	1	1
Female	36 (29.0)	2.1 (1.21-3.60)	1.9 (1.05-3.61)
Abdominal obesity (n = 236)			
Sex	n (%)	PRa (95%CI)	PRb (95%CI)
Male	13 (11.8)	1	1
Female	62 (49.2)	4.2 (2.40-7.10)	3.1 (1.80-5.50)
Smoking or former smoking (n = 234)			
Sex	n (%)	PRa (95%CI)	PRb (95%CI)
Male	90 (82.57)	1	1
Female	36 (28.80)	0.7 (0.65-0.75)	0.73 (0.67-0.80)
Poor diet score (n = 234)			
Sex	n (%)	PRa (95%CI)	PRb (95%CI)
Male	98 (89.9)	1	1
Female	101 (80.8)	0.9 (0.80-0.99)	1.0 (0.86-1.09)

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Table 2 - Distribution, PR, and 95% confidence intervals of cardiometabolic risk factors according to sex in a Brazilian rural population

Altered total cholesterol (n = 228)			
Sex	n (%)	PRa (95%CI)	PRb (95%CI)
Male	62 (59.1)	1	1
Female	91 (73.9)	1.2 (1.03-1.51)	1.3 (1.06-1.68)
Altered triglycerides (n = 228)			
Sex	n (%)	PRa (95%CI)	PRb (95%CI)
Male	24 (22.9)	1	1
Female	35 (28.5)	1.2 (0.79-1.95)	1.0 (0.59-1.69)
Altered LDL cholesterol (n = 228)			
Sex	n (%)	PRa (95%CI)	PRb (95%CI)
Male	22 (20.9)	1	1
Female	46 (37.4)	1.8 (1.15-2.76)	2.4 (1.31-4.21)
Altered HDL cholesterol (n = 228)			
Sex	n (%)	PRa (95%CI)	PRb (95%CI)
Male	34 (32.4)	1	1
Female	58 (47.2)	1.5 (1.04-2.03)	1.3 (0.89-1.97)
Dyslipidemia (n = 228)			
Sex	n (%)	PRa (95%CI)	PRb (95%CI)
Male	85 (80.9)	1	1
Female	112 (91.1)	1.1 (1.01-1.25)	1.1 (1.01-1.29)
Altered glucose (n = 228)			
Sex	n (%)	PRa (95%CI)	PRb (95%CI)
Male	11 (10.5)	1	1
Female	25 (20.3)	1.9 (1.01-3.75)	1.9 (0.91-3.99)
Arterial hypertension (n = 236)			
Sex	n (%)	PRa (95%CI)	PRb (95%CI)
Male	63 (57.3)	1	1
Female	77 (61.1)	1.1 (0.86-1.32)	1.1 (0.83-1.42)
Metabolic syndrome (n = 228)			
Sex	n (%)	PRa (95%CI)	PRb (95%CI)
Male	17 (16.2)	1	1
Female	51 (41.5)	2.6 (1.57-4.15)	2.2 (1.25-3.84)

Note: PR: Prevalence ratio; 95%CI: 95% confidence intervals; b: crude analysis; a: analysis adjusted for age and education; Source: VDG/Caju/SPJ, 2008-2010.

DISCUSSION

The results showed that prevalence of cardiometabolic risk factors in rural areas was high, with dyslipidemia being the most common factor. When analyzed by sex, the frequency of risk factors was higher in women compared to men, with the exception of smoking. Another relevant finding was the simultaneous occurrence of several determinants of cardiometabolic diseases such as altered waist circumference, dyslipidemia, hypertension, hyperglycemia, smoking, and poor diet; four of them or more were verified in almost half of the population. These results demonstrate the high prevalence of factors associated with cardiovascular diseases and their co-occurrence among the elderly.

Aging, by itself, is associated with the high probability of involvement by non-communicable chronic diseases, particularly cardiovascular conditions.[4] However, a difference in the development of these diseases is observed according to life habits, with lower frequency and severity observed in elderlies who exhibit healthy behaviors such as adequate diet and regular practice of physical activities.[2,4]

The high prevalence of risk factors for chronic diseases found in this study was similar to findings in other studies.[4,17] For instance, research among users of the Brazilian Unified Health System showed that 80.4% of elderly presented hypertension; 83.3% abdominal obesity; 32.2% obesity; 23.4% dyslipidemias, 19.1% diabetes *mellitus*; and 10.0% were smokers.[4] Results from a cohort, conducted with elderly people in Bambuí, Minas Gerais, demonstrated that the frequency of diabetes *mellitus* and systolic hypertension increased with age, in addition to the increase in drug treatment for both diseases.[18]

The determinants of chronic diseases occurred in an agglomerated form in the present study, which usually represents increased overall risk for cardiovascular disease compared to risks resulting from the sum of their individual effects, indicating a synergistic effect between them.[5] This clustering was greater than that reported in other surveys conducted with individuals 60 years or older[4,18]. A potential explanation, besides the pathophysiological mechanisms for this finding, may be related to socioeconomic factors such as poverty and low educational level of the studied population and the quality of health care services in rural areas. The rural geographical barriers constitute a factor that prevents the increased access and utilization of health services, which, consequently, hinders the monitoring and prevention of chronic diseases and risk factors.[19]

It is known that the elderly population requires more care and attention from health services compared to younger people as a function of the development of diseases associated with ageing and greater vulnerability to chronic conditions. However, the Family Health Strategy program and primary health care services underscore the unspecificity of the care provided to the elderly, demonstrating a focus on diseases to the detriment of the interaction between physical and mental health, in addition to social issues.[20]

Recent studies highlight that risk factors associated with the development of NCDs are among the main precursors of premature mortality and years lived with disability, without discrimination between urban and rural areas.[2] In addition, these factors are related to the loss of quality of life and adverse economic impacts on families and society in general.[21]

Compared to other studies, our findings also detected important differences between sex, with women being more susceptible and affected by determinants of NCDs [22] and showing greater prevalence of metabolic syndrome as demonstrated in another study conducted in a rural area.[23] It is important to highlight the difference of life expectancy between women and men; according to the World Health Organization,[24] women are more prone to develop chronic diseases because they live longer. This factor was taken into account in this study because all analyses were adjusted for age.

Evidences show that women have more physical problems related to mobility, more difficulties to recover from disabilities, worsen perception of health, they report more chronic illnesses, and seek health services more frequently than men. Therefore, they begin treatment in the early stages of the disease and have reduced hospitalization rates.[25]

The projections of studies in the country reveal that the elderly population should surpass from 20 million in 2010 to 60 million in 2050[24], which makes the development of public policies aimed at this age group a priority in the national health agenda.

In Brazil, in 1994, the National Policy for the Elderly was established with the goal of ensuring social rights to the elderly person promoting autonomy and effective participation of this group in the society. Since then, other initiatives have been implemented such as the Elder Statute and the National Health Policy of the Elderly Person.[20] However, the adequate attention to ageing is still a challenge in the country; the implementation of specific health policies that encourage changing the health profile of older persons, maintenance of the functional capacity, and improvement in the quality of life of this growing part of the population is of the utmost importance.

Some considerations referred to the external validity of the findings should be recognized. The first one is related to the representativeness of the studied population, which somehow restricts the extrapolation to other rural populations in Brazil. The second limitation is related to the cross-sectional design of the study, which requires that prevalence differences shown between subgroups should be analyzed with caution; therefore, they should be confirmed in studies with designs that allow estimations of incidence.

CONCLUSION

This study confirms the high prevalence of cardiovascular risk factors, isolated and agglomerated, in a population of elderly residents in rural areas, particularly among women. The results of this study advocate for effective public policies for the prevention of cardiometabolic diseases aiming at healthy aging and the pursuit of equity in the provision of public services to the Brazilian population.

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