Original Article

The Profile of Cardiovascular Health of Elderly Brazilian People Needs to Improve: a Population-Based Study

Janaina Caldeira Pereira, Sandhi Maria Barreto, Valéria Maria A. Passos
Universidade Federal de Minas Gerais (UFMG), Belo Horizonte, MG – Brazil

Summary

Background: In Brazil, population-based information on risk factors and their relationship with cardiovascular diseases in the elderly is scarce.

Objective: To estimate the prevalence and clustering of risk factors and investigate their association with ischemic heart disease (IHD) in elderly people.

Methods: All subjects ≥60 years of age participating in the "Inquérito domiciliar sobre comportamentos de risco e morbidade referida de doenças e agravos não transmissíveis" (Household Survey on Risk Behaviors and Reported Morbidity of Non Transmissible Diseases and Health Conditions) carried out by the Ministry of Health, in 2002/2003 in 15 capitals and the Federal District were included. The prevalence of risk factors (smoking, alcohol consumption, lack of physical activity, inappropriate diet, and obesity) and reported morbidity (hypertension, hypercholesterolemia, and diabetes) was assessed, as well as the association between IHD and clustering of these factors using the Poisson regression model.

Results: Elderly individuals represented 13.4% (3,142/23,457), 59.4% women and 40.6% men. The mean age of the participants was 69.5 years. Approximately 50% of participants reported having hypertension, 33% hypercholesterolemia, and 18% diabetes. Smoking and hypercholesterolemia dropped significantly with age. Hypertension, physical inactivity, obesity, and hypercholesterolemia were more prevalent among women. Clustering of two or more factors was observed in 71.3% of the elderly, and diminished with age. Elderly subjects with IHD had a four-fold higher prevalence of clusters with four or more factors (PR=4.1; 95% CI: 2.6-6.4).

Conclusion: The relationship between IHD and a larger clustering of risk factors probably represents a greater accumulated risk throughout life, but it also indicates the need to improve the risk profile of these elderly people. (Arq Bras Cardiol 2008;91(1):1-10)

Key words: Aged; cardiovascular diseases; risk factors; prevalence.

Introduction

The world population is living longer than ever. Aging populations represent a greater concern with health care, medical advances in the fight against diseases, and environmental improvements. In Brazil, the growth of the elderly population is primarily due to the decline in fertility and mortality over the past decades. Projections estimate that the number of elderly people will double in the country within the next 15 years[1]. Ageing underlines the importance of maintaining good health and autonomy. Ageing, in and of itself, increases the risk of chronic disease, especially cardiovascular disorders. However, the development of these diseases strikes individuals in different manners, with lower rates and severity in those with healthier medical histories and lifestyles.

Mailing address: Janaina Caldeira Pereira •
Rua Itapemirim, 176/404, Serra, 30.240-000, Belo Horizonte, MG - Brazil
E-mail: janacgodoy@yahoo.com.br
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The incidence of cardiovascular disease in adults approximately doubles with each decade of life[2]. Despite increasing with age, a large part of these diseases could be prevented. Since the most frequent chronic diseases (cardiovascular, cancer, and diabetes) share several of the same risk factors, the World Health Organization proposed an approach of integrated prevention and control for all ages based on the reduction of the following factors: systemic arterial hypertension (SAH), smoking, alcohol consumption, lack of physical activity, inappropriate diet, obesity, and hypercholesterolemia[3].

Studies have shown that these factors tend to occur simultaneously[4-6]. Usually, their combination represents an increased global risk for cardiovascular disease compared to the risk resulting from the sum of their separate effects, indicating a synergetic effect among them[7]. Estimates of the effect of clustering of these factors consider that many of them are interrelated and have an intermediary role within a causal chain[8,9]. Therefore, effective prevention of cardiovascular disease can be attained only through a global improvement of the risk profile of individuals and populations.

In Brazil, there is little population-based information on clustering of risk factors for cardiovascular disease in the elderly. This study analyzed data from the "Household Survey on Risk Behaviors and Reported Morbidity of Non Transmissible Diseases and Health Conditions" carried out by the Ministry of Health[10] with the objective of describing the prevalence and clustering of cardiovascular risk factors, as well as investigating their association with reports of ischemic heart disease (IHD) in elderly patients.

Methodology

The population in this study consists of participants of the "Household Survey on Risk Behaviors and Reported Morbidity of Non Transmissible Diseases and Health Conditions" carried out by the National Cancer Institute and the National Health Surveillance Agency of the Ministry of Health, from 2002 to 2003. This was a cross-section population-based study consisting of 23,457 individuals, ≥ 15 years of age, residents of 16 capitals: Aracaju, Belém, Belo Horizonte, Brasília, Campo Grande, Curitiba, Florianópolis, Fortaleza, João Pessoa, Manaus, Natal, Porto Alegre, Recife, Rio de Janeiro, São Paulo, and Vitória. The sample was self-weighted and was selected in two stages. Details on methodology and data collection are available in the official publication of the survey[10].

This study enrolled 3,142 individuals of both genders (13.4% of the participants), ≥ 60 years of age (cut-off age for elderly people recommended by WHO for developing countries).

Three groups of variables were analyzed:

• Socio-demographic characteristics: age (60 to 69, 70 to 79, 80 or more years), gender and educational level (0 to 3, 4 to 7, 8 or more years of schooling);

• Modifiable risk factors: physical activity, smoking, alcohol consumption considered high-risk, inappropriate diet, obesity, and reported morbidity - SAH, hypercholesterolemia, and diabetes;

• Disease: report of IHD.

Participants' level of physical activity was assessed through the short format of the International Physical Activity Questionnaire – IPAQ, recommended by the WHO to measure physical activity in adults from 15 to 69 years of age[11]. Thus, in this study, this variable was measured only in the younger portion of elderly patients (60 to 69 years of age). The IPAQ questionnaire has questions on the frequency (number of days per week), duration (total time spent in physical activity per day), and intensity of physical activity (light, moderate, and vigorous) over the previous seven days. Individuals are classified as very active, active, irregularly active, and sedentary according to the scores obtained on the IPAQ. Those individuals classified as irregularly active or sedentary were considered part of the high-risk group.

Body Mass Index (BMI) was used to define obesity, which was calculated using information on weight and height, with a cut-off point of 30 kg/sq m for obesity[12].

Individuals were classified within three categories: smokers (individuals who had smoked at least 100 cigarettes over their lifetime and currently smoked), ex-smokers (individuals who had smoked at least 100 cigarettes during their lifetime, but no longer smoked), and non-smokers[13].

The alcohol consumption considered high-risk was identified as men who reported having had more than two drinks per day, and women who reported having had more than one drink per day over the previous 30 days. One drink corresponded to a half-bottle or a can of beer, a small glass of wine, or a dose of distilled alcoholic beverage (cachaça, whisky, etc)[13].

To evaluate high-risk eating patterns, we used information on the daily frequency of consumption of fruits and/or leguminous plants and/or vegetables. The consumption of less than five portions of these foods per day was considered a health risk behavior[13].

SAH was determined according to the answer given to the question: "Has any physician, nurse, or community health agent ever told that you have high blood pressure?"

Individuals who reported having diabetes, high cholesterol, and ischemic heart disease gave affirmative answers to the following questions:

- "Has any physician ever told you that you have diabetes?"

- "Has any physician, nurse, or nutritionist ever told you that you have high cholesterol levels?"

- "Has any physician ever told you that you have or had a heart attack, infarction, angina, or coronary disease?"

Distribution of prevalence of risk factors and morbidity by age bracket and gender were calculated using ratio measurements with estimates of Pearson's chi-square and its 95% confidence interval (95% CI).

To investigate the clustering of cardiovascular risk factors (CVRF), a score was created that combined modifiable risk factors (smoking, alcohol consumption, and inappropriate diet) and reported morbidity (hypertension, diabetes, and hypercholesterolemia). Variables reported by more than 75% of the total number of elderly patients were included. Since the information on physical activity was obtained only from the younger patients (60 to 69 years of age), the score was analyzed separately for this age group with the inclusion of physical inactivity.

The percentages of answers for each variable were: 88.0% (n=2,765) for smoking: 87.9% (n=2,763) for diet; 87.1% (n=2,737) for alcohol consumption; 86.9% (n=2,731) for hypertension; 77% (n=2,419) for hypercholesterolemia; 76.2% (n=2,393) for diabetes, and 56.7% (n=988) for IPAQ. Weight and height measurements were reported by 2,094 (66.6%) individuals for BMI calculation purposes, and 2,631 (83.7%) gave answers about IHD.

The association between reported cases of IHD and the clustering score of CVRF was analyzed, adjusted as per socio-demographic characteristics. This score ranged from one to four: 1) from zero to one, 2) two, 3) three, and 4) four or more factors, in any combination. The association between IHD and variables of interest was studied by univariate analysis. Variables with $p<0.20$ values were included in the multivariate model, and associations with $p<0.05$ were considered significant. The magnitude of these associations

and their corresponding 95% confidence intervals were measured using the prevalence ratios obtained by Poisson Regression adapted for cross-sectional studies[14]. The analysis was carried out using STATA 9.0 software, which has procedures designed to analyze data from complex sample surveys. These procedures allow the inclusion of different weights of the observations that influence timepoint estimates of parameters of the total population.

The survey was developed to protect the privacy of the individuals taking part, warranting anonymous and voluntary participation. The criteria established by the Ethics Committee of the National Cancer Institute and by the National Council on Ethics in Research (CONEP) were followed.

Results

Of the 3,142 elderly individuals, 1,868 (59.4%) were women and 1,274 (40.6%) were men. The mean age was 69.5 (± 0.19) years and 1,742 (55.44%) patients were aged between 60 and 69 years. The average time of schooling was 5.6 years (95% CI: 5.2-5.9). According to Pearson's chi-square estimate, the distribution of the sociodemographic characteristics showed a significant majority of women in all age brackets ($p<0.05$).

The prevalence of the risk factors and reported morbidity and their corresponding 95% confidence Intervals are shown in Figure 1. The prevalence of inappropriate diet was 94.4% (95% CI: 92.8-95.6). There were no significant differences between genders and age brackets. SAH was the second most prevalent factor (50.6%; 95% CI: 47.9-53.2). In both genders, the age bracket with the greatest percentage of hypertension was 70 to 79 years. A significant association between hypertension and age was observed only among women ($\chi^2= 15.1$; $p= 0.01$). Approximately 40% of the elderly individuals under 70 years of age were classified as insufficiently active or sedentary. A higher proportion of active or very active individuals was found among men (64.3%, 95% CI: 57.9-70.3), with a statistically significant difference between genders ($\chi^2= 10.18$ $p= 0.01$). Obesity was more prevalent among women (19.3%, 95% CI: 16.6-22.3, $\chi^2 =9.5$; $p=0.03$). Among men, the prevalence of obesity declined with age, with no statistical significance ($\chi^2 =2.5$; $p=0.6$). Eight hundred and twenty-nine patients, i.e., 33.1% (95% CI: 30.7-35.5), reported hypercholesterolemia, with a higher prevalence among women, and declined with age ($\chi^2=10.04$; $p=0.05$). The prevalence of smokers was significantly reduced (12.7%, 95% CI: 11.1-14.5) with age ($\chi^2=66.6$; $p=0.001$). Conversely, the percentage of ex-smokers (30.4%, 95% CI: 28.1-32.7) increased with age among men and decreased among women. High-risk alcohol consumption was observed in 3.2% (95% CI: 2.3-4.4) of all respondents and was greater among men ($\chi^2=54.5$; $p=0.001$) and in the range of 60 to 69 years of age ($\chi^2=25.3$; $p=0.01$).

The prevalence of diabetes was 17.83% (95% CI: 15.74-20.12) and greater among men ($\chi^2=10.6$, $p=0.03$). No significant difference was observed among age brackets ($\chi^2=1.5$; $p=0.6395$).

The clustering of two or more CVRFs was observed in 71.3% of the elderly patients (n=2,219). The oldest patients, 80 or more years of age, had smaller clusters when compared to the other age groups ($\chi^2= 40.9$; $p=0.001$). A significant association between clustering and age was observed only among women ($\chi2= 30.1$; $p= 0.004$).

IHD was reported by 12.6% of the respondents (n=2,765), with no significant difference as per gender and age bracket. In the separate analysis by gender, a significant association was observed among men as to age. In the univariate analysis between IHD and selected variables, smoking (ex-smokers), obesity, hypertension, hypercholesterolemia, and diabetes were significant. In the adjusted multivariate model, the obesity variable lost significance ($p>0.05$) (Table 1). Elderly patients with clusters of four or more CVRFs had a four-fold higher probability (PR=4.1 95% CI: 2.5-6.4) of reporting IHD compared to those with no factor or one single factor after adjustments (Table 2). In the separate analysis conducted for the younger elderly patients, the chance of reporting IHD also increased with a greater number of CVRFs, and it was greater for all score categories compared to the total sample, both before and after the inclusion of physical inactivity (Table 3).

Discussion

The survey carried out by INCA/SVS[10] provides data on the urban population from a large portion of the country in an unprecedented way. The lack of comprehensive nation-wide data on CVRFs is due to the size and cost of this type of study. The use of reported morbidity data, instead of data from an objective collection (measurements of SAP, glycemia, etc.), enables the collection of reliable information at more adequate costs in a developing country the size of Brazil.

Studies undertaken both abroad and in Brazil have shown the validity of the information reported with sensitivity and specificity for detecting health-related conditions. However, globally, more accessible diagnoses, such as SAP and diabetes, are more reliable than others such as of cholesterol levels[15-18].

Older populations are heterogeneous and the analysis of risk factors differs from that performed in younger adults. Their characteristics are influenced mainly by historic events that characterize the different birth cohorts, survival biases, and gender-related differences.

The reduction in prevalence of risk factors such as smoking and alcohol consumption over age might reflect both early mortality of younger adults exposed to these factors and changes in high-risk behaviors after illness develops. Nevertheless, this study has shown that the prevalence of some of the main risk factors such as SAP, physical inactivity, hypercholesterolemia, and inappropriate diet, remain high. The probability of IHD being reported increased with the greater clustering of these factors.

The greater prevalence of smoking among men involves historic and cultural aspects. Smoking tobacco began in the world typically as a masculine habit that was dramatically disseminated after World War I. Among women, tobacco smoking was uncommon before de 1930's. The decline in the number of smokers with age has been observed in both genders, probably due to the survival bias, which corroborates

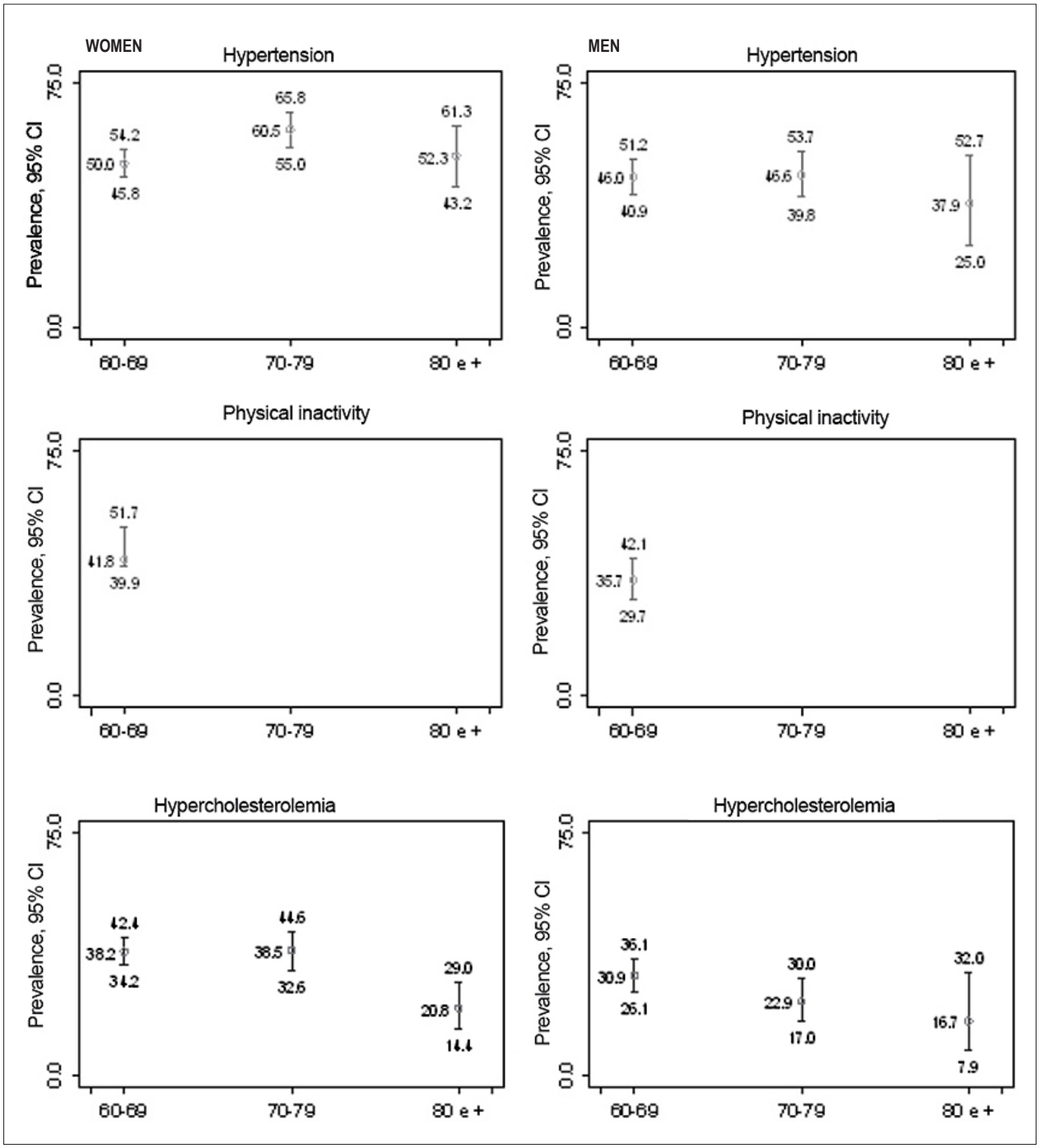

Fig. 1 - Prevalences of cardiovascular risk factors in elderly people. Brasil, 16 capitals, 2002-2003.

the results from other studies[19,20].

The significant prevalence of women in all age brackets may be explained by gender-related biological factors and by gender-related sociocultural factors[21]. Women had a greater prevalence of SAP, physical inactivity, obesity, and hypercholesterolemia. These results may reflect actual differences in the distribution of these factors, but, more likely, they may also express more readily available information on health status and a better possibility of diagnosis since women are more likely to seek health care when needed. The greater prevalence of HAS among women was also reported by the National Household Sample Survey *(Pesquisa Nacional por Amostra de Domicílio – PNAD)* 1998[22] and in populations of São Paulo[23] and Campinas, where similar percentages and greater frequencies were

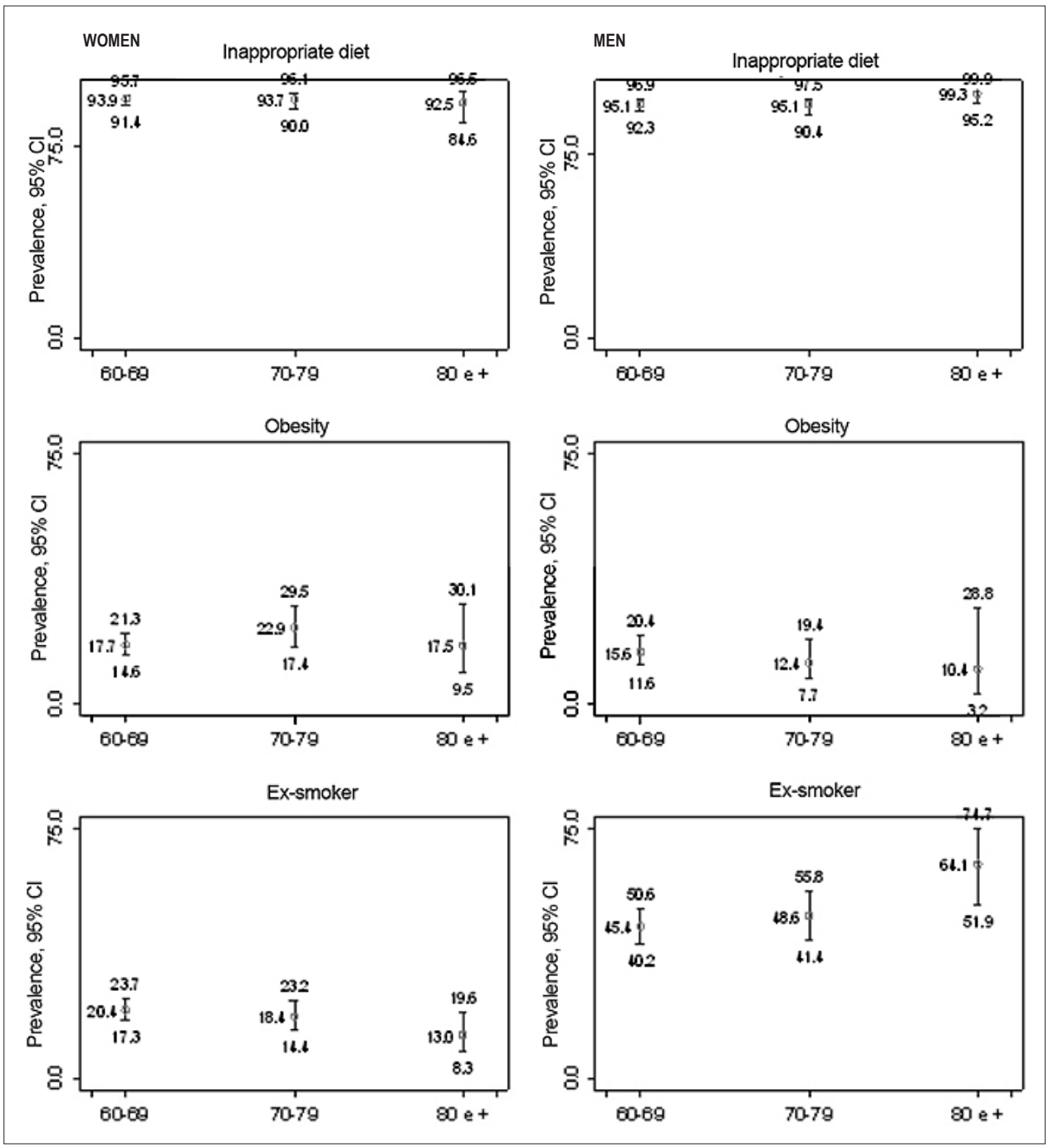

Fig. 1 - (continuation) Prevalences of cardiovascular risk factors in elderly people. Brasil, 16 capitals, 2002-2003.

also observed in the groups 70 to 79 years of age[24]. The lower frequency of obesity among men is consistent with findings from other Brazilian population-based studies[25,26], and may be related to the higher level of work-related physical activity in men and factors such as pregnancies and hormonal changes in women.

Hypercholesterolemia increases with age for men and women, and tends to decline in the older age brackets. In men, cholesterol levels increase up to 45-50 years of age and then start to decline. In women, cholesterol levels tend to increase after menopause and decline later, around 60-70 years of age, with a similar tendency of reduction after that period for both genders. Among the factors involved in the reduction of cholesterol levels in elderly people, some are more significant: deficient absorption, reduced ingestion of cholesterol-rich foods, selective mortality for

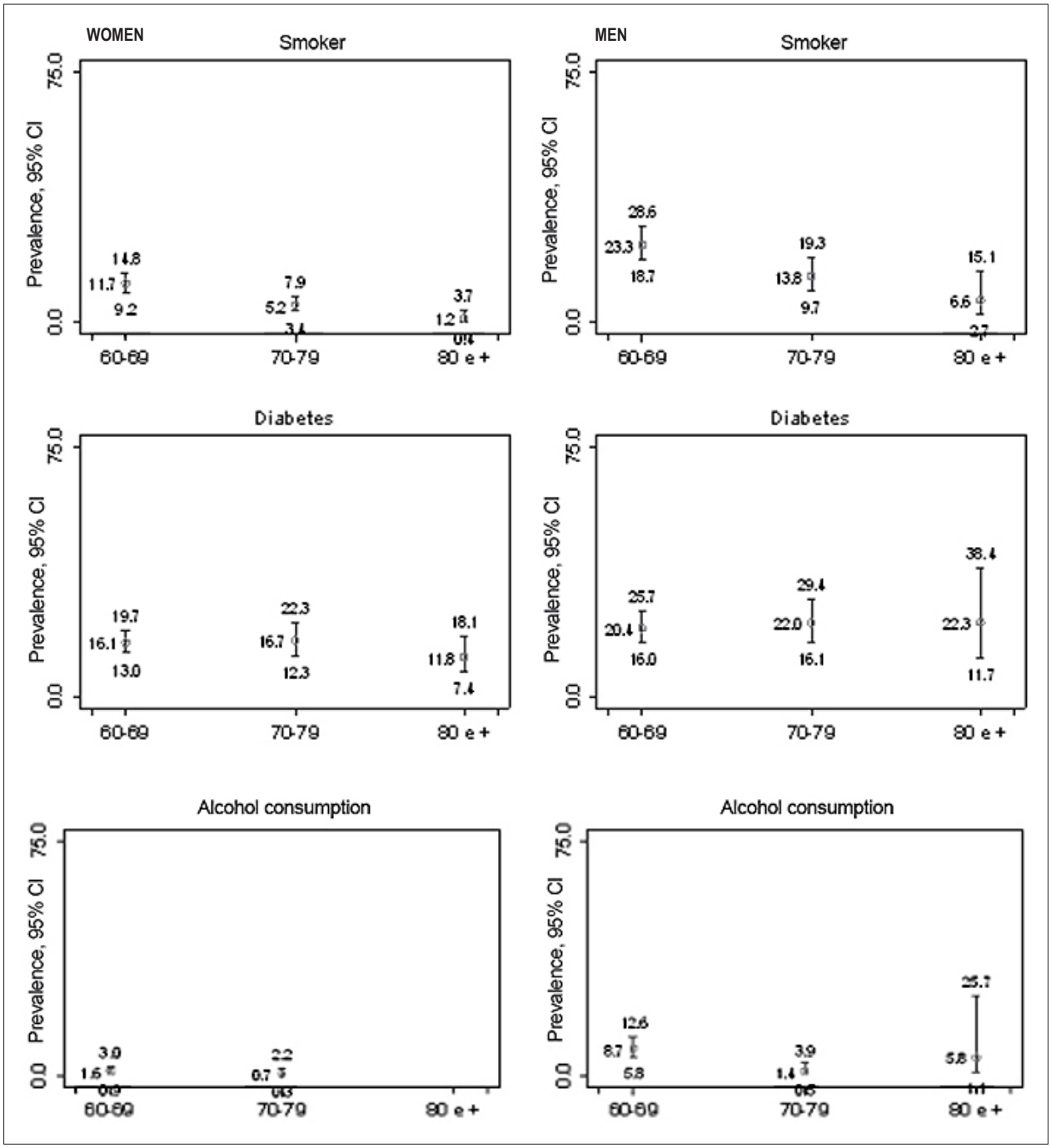

Fig. 1 - (continuation) *Prevalences of cardiovascular risk factors in elderly people. Brasil, 16 capitals, 2002-2003.*

individuals with hypercholesterolemia, and the effect of comorbidities[27]. In this study, the greatest prevalence among women may be attributed to the age and gender distribution of the sample, with 55.44% of younger elderly subjects and 60% of women. A lower prevalence of hypercholesterolemia among elderly people was noted compared to the results of the "*Campanha nacional de alerta sobre o colesterol elevado*" (National High Cholesterol Awareness Campaign) which identified 40% of Brazilians with the disorder. In this campaign, participation was voluntary and the determination of cholesterol levels was not carried out with a representative sample of the population; moreover, the mean age was approximately 15 years younger than that of the sample evaluated in our study. Determinations made with voluntary participants tend to overestimate the prevalence of factors such as cholesterol levels, as it is likely

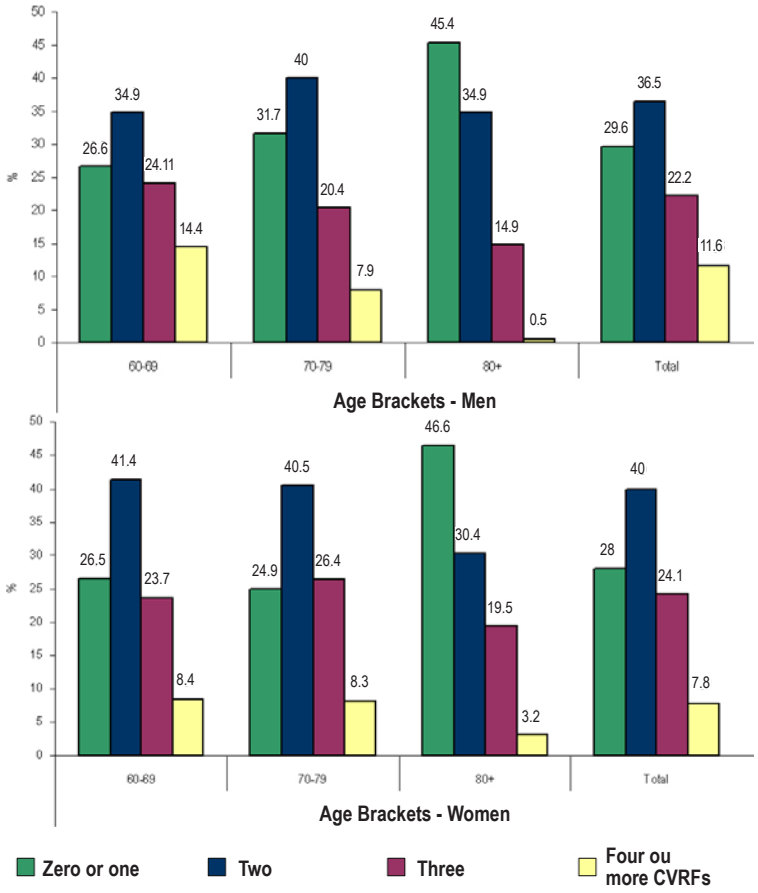

Fig. 2 - Clustering of CVRFs in elderly patients by gender and age bracket. Brazil, 2002-2003. CVRF score: Any combination of risk factors - tobacco smoking, alcohol consumption, inappropriate diet and reported morbidity, hypertension, diabetes and hypercholesterolemia.

that people with inappropriate diets or familial tendencies feel more inclined to participate and have their cholesterol levels determined than others[28].

The prevalence of diabetes is consistent with findings about the elderly population living in São Paulo (17.9%)[23] and in the United States (16.9%)[29], and is higher than that observed in Bambui (14.59%)[30]. The risk of type 2 diabetes increases with age and is enhanced by obesity, physical inactivity, and an inappropriate diet, factors that typically tend to go together and have a high prevalence among elderly Brazilian people. Diabetes is a severe CVRF, especially for IHD. A study recently conducted on multiple causes of death in Brazil indicates that 39% of the adults with diabetes-related deaths died of coronary disease[31].

The reduced number of physically active elderly people may be partially due to lack of information and adequate venues for exercise. Besides facilitating social interaction among elderly people, physical activity helps to maintain independence to perform daily activities, and to reduce and control CVRFs and conditions such as IHD. The prevalence of physical inactivity was greater than had been observed in Pelotas (29.3%) and São Paulo (8.35%)[32].

Epidemiological evidence shows an inverted relationship between an appropriate consumption of fruits and vegetables and the risk of CVD[33]. Our study showed that only a minority of elderly people follows the nutritional recommendations set by WHO as to the consumption of these foods. A high prevalence of inappropriate eating habits was also identified in the "*Inquérito Mundial de Saúde*" (World Health Survey) conducted in Brazil in 2003[34], in the Pesquisa de Orçamento Familiar de 2002/2003[35] (Survey on Family Income 2002/2003), and among elderly people living in Belo Horizonte[36].

Most elderly adults had more than two CVRFs. The increased clustering of these factors with age within urban areas is widely divulged in literature[4-7]. Nevertheless, our findings indicated a reduction in clustering with age, which may mean that the individuals still alive, especially those who reported IHD, managed to change behaviors. This conclusion is corroborated by the higher magnitude of the association found between clustering and IHD in younger elderly people as compared to the global sample.

IHD stands out among the cardiovascular disorders by the magnitude of its different clinical manifestations. A greater prevalence among the elderly is considered to be

Table 1 - Association between reported ischemic heart disease and selected variables in elderly patients. Brazil, 2002-2003.

Variable*	PR and 95% CI†	Adjusted PR and 95% CI‡
Hypertension		
No	1.0	1.0
Yes	2.0 (1.6-2.7)	1.9 (1.3-2.6)
Hypercholesterolemia		
No	1.0	1.0
Yes	1.8 (1.3-2.2)	1.6 (1.2-2.1)
Smoking (ex-smoker)		
No	1.0	1.0
Yes	1.4 (1.1-1.9)	1.5 (1.1-2.2)
Current smoker		
No	1.0	1.0
Yes	1.1 (0.7-1.8)	1.7 (0.9-2.9)
Diabetes		
No	1.0	1.0
Yes	1.8 (1.3-2.4)	1.4 (1.1-2.0)
Obesity		
No	1.0	1.0
Yes	1.4 (1.0-2.0)	1.2 (0.9-1.7)

**Variables with p>0.2 values in the univariate analysis. Multivariate analysis: † Prevalence ratio (PR) and 95% confidence interval. ‡ Prevalence ratio adjusted for gender, age, and educational level.*

Table 2 - Association between ischemic heart disease and clustering of CVRF in elderly patients. Brazil, 2002-2003.

	Reported ischemic heart disease (n=2219)			
CVRF score*	Yes	No	% prevalence and 95% CI	Adjusted PR† and 95% CI
Zero or one	49	609	7.9 (5.4-11.5)	1.00
Two	110	730	12.4 (9.7-15.8)	1.6 (1.0-2.6)
Three	79	437	16.5 (12.8-20.1)	2.2 (1.4-359)
Four or more	64	141	30.0 (22.4-38.7)	4.1 (2.6-6.4)

**CVRF score: Any combination of risk factors - tobacco smoking, alcohol consumption, inappropriate diet and reported morbidity, hypertension, diabetes and hypercholesterolemia. †Prevalence ratio (PR) and 95% confidence interval adjusted for gender, age, and educational level.*

Table 3 - Association between ischemic heart disease and clustering of CVRF in younger elderly patients (60 to 69 years of age). Brazil, 2002-2003.

	Reported ischemic heart disease			
CVRF score* (n = 1,312)	Yes	No	% prevalence / 95% CI	Adjusted PR and 95% CI‡
Zero or one	23	445	2,7 (1,5-4,7)	1,00
Two	65	384	12,8 (9,6-16,9)	4,8 (2,5-9,2)
Three	52	248	15,3 (13,3-21,5)	5,8 (2,9-11,7)
Four or more	29	66	27,4 (18,7-37,3)	10,4 (5,4-20,1)
CVRF score† (n = 814)				
Zero or one	12	183	3,0 (1,3-6,8)	1,00
Two	28	219	10,7 (6,3-17,4)	3,6 (1,3-9,8)
Three	27	202	11,0 (6,3-18,8)	3,6 (1,3-10,2)
Four or more	34	109	20,4 (13,7-29,2)	7,1 (2,8-17,9)

CVRF score: Any combination of risk factors - tobacco smoking, alcohol consumption, inappropriate diet and reported morbidity - hypertension, diabetes and hypercholesterolemia. †CVRF score2: Any combination of risk factors - tobacco smoking, alcohol consumption, inappropriate diet, physical inactivity, and reported morbidity - hypertension, diabetes, and hypercholesterolemia. ‡Prevalence ratio (PR) and 95% confidence interval adjusted for gender, age, and educational level.*

due to a combination of factors that go beyond typical age-related physiological changes, especially the accumulation of risk factors throughout life. Among the many conditions associated with IHD and described in literature, arterial hypertension, hypercholesterolemia, and tobacco smoking are the strongest risk factors for this disease[37-39]. These factors showed a larger number of associations with IHD when compared to other factors evaluated in the multivariate analysis. The increased prevalence of reported ischemic disease with a greater clustering of CVRFs highlights the importance of determining the cardiovascular risk based on the patient's number of risk factors.

Many of the variations observed in the risk of CVD in different populations may be understood by clustering, since risk factors tend to operate synergically, thus exerting an effect greater than an additive impact[9].

The cross-sectional design of this study does not allow causal or temporal inferences on the association between dependent and independent variables[40]. Aside from the survival bias commonly found in studies conducted with elderly individuals, self-reported information may be influenced by access to healthcare services and memory biases. Despite the fact that it was conducted in 16 capitals, including the largest cities in the country, this survey is not representative of the entire Brazilian population and the characteristics of the sample did not allow data disaggregation by region.

Conclusions

The relationship between IHD and a greater clustering of risk factors probably represents a greater accumulated risk throughout life, but it also indicates the need to improve the risk profile of these elderly people.

Health surveys allow the collection of data and the development of indicators related to health and not only to disease, and more, to obtain information on risk factors and social determinants of the health/disease process. This information helps to approach the subject of health of the elderly from a multidimensional perspective, oriented

towards the prevention of outcomes related to chronic non-transmissible diseases and the development of public policies focused on a healthy aging process.

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Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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Study Association

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