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Prevalence and simultaneity of cardiovascular risk factors in elderly participants of a population-based study in southern Brazil

Prevalência e simultaneidade de fatores de risco cardiovasculares em idosos participantes de um estudo de base populacional no sul do Brasil

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ABSTRACT: ***Objective:*** To investigate the prevalence of simultaneity of cardiovascular risk factors and their association with socio-demographic characteristics in older adults in Southern Brazil. ***Methods:*** Cross-sectional study with 1.553 elderly participants of the EpiFloripa study in Florianópolis-SC. The risk factors evaluated were: Inadequate fruit and vegetable consumption, insufficient leisure-time physical activity, alcohol consumption and smoking. The construction of the outcome was performed by combining all of the factors mentioned and then categorized. Bivariate and multivariate analyzes were performed using the Poisson regression. ***Results:*** It was found that 57.6% of the elderly coexist with the simultaneity of cardiovascular risk factors. The combination of inadequate fruit and vegetable consumption and insufficient leisure-time physical activity was the most prevalent. The highest prevalence observed in women and men was the insufficient leisure-time physical activity and inadequate fruit and vegetable consumption of 46.4 and 28.1%, respectively. The observed prevalence of the four factors was higher among men (2.5%), whereas for women (0.3%). Men were 11.0% more likely to accumulate risk factors compared to women. And each additional year of schooling represents 4.0% less probability of accumulating cardiovascular risk factors. ***Conclusions:*** The differences between the simultaneity of risk factors and sociodemographic aspects should be considered in the approach for older adults, both at the individual level and in the construction of public policies.

Keywords: Risk factors. Life style. Cardiovascular diseases. Aged. Cluster analysis.

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RESUMO: ***Objetivo:*** Investigar a prevalência da simultaneidade de fatores de risco cardiovasculares e sua associação com características sociodemográficas em idosos no sul do Brasil. ***Metodologia:*** Estudo transversal com 1.553 idosos participantes do Estudo Epidemiológico das Condições de Saúde dos Idosos de Florianópolis (EpiFloripa Idoso), Santa Catarina. Os fatores de risco foram: insuficiência no consumo de frutas, legumes e vegetais (FLV), insuficiência de atividade física no lazer, consumo abusivo de álcool e tabagismo. Construiu-se a variável desfecho através da combinação de todos os fatores, categorizada em nenhum, um, dois, três e quatro fatores de risco. Foram realizadas análises bivariadas e multivariadas empregando-se a regressão de Poisson. ***Resultados:*** Constatou-se que 57,6% dos idosos convivem com a simultaneidade de fatores de risco para doenças cardiovasculares. A maior prevalência observada tanto nas mulheres quanto nos homens foi da insuficiência de atividade física com a insuficiência no consumo de FLV, sendo de 46,4 e 28,1%, respectivamente. A prevalência observada dos quatro fatores simultâneos foi maior entre os homens (2,5%) em comparação às mulheres (0,3%). O sexo masculino apresentou 11,0% mais probabilidade de acumular fatores de risco comparado ao sexo feminino. E cada ano a mais de escolaridade representa 4,0% a menos de probabilidade de acumular fatores de risco cardiovasculares. ***Conclusões:*** As diferenças entre a simultaneidade de fatores de risco e aspectos sociodemográficos devem ser consideradas na abordagem do idoso tanto em nível individual quanto na construção de políticas públicas.

Palavras-chave: Fatores de risco. Estilo de vida. Doenças cardiovasculares. Idoso. Análise por conglomerados.

INTRODUCTION

Cardiovascular diseases (CVD) constitute the main group of noncommunicable chronic diseases (NCDs) and the leading cause of morbidity and mortality in the Brazilian population and around the world, representing about one third of global deaths[1-3]. In addition, these diseases have a major impact on the economy, health systems and social security[4].

Aging-related physiological changes associated with risk behaviors have been related to the high prevalence of CVD in the elderly[5]. Despite its increasing incidence with advancing age, the World Health Organization (WHO) estimates that most of these morbidities could be prevented, and that three-quarters of cardiovascular mortality can be decreased with lifestyle changes aimed at controlling risk factors[6,7].

Most risk factors established in the literature are: blood pressure, high blood glucose, dyslipidemia, being overweight, and abdominal obesity, all of which can be controlled by changing inappropriate eating habits, physical inactivity, alcohol abuse and smoking[6-12].

However, in addition to assessing the prevalence and defining strategies to combat these factors in isolation, it is important to consider how they work together. Studies show that the interaction of these factors is more worrisome than just their sum when it comes to health problems, due to their synergistic effect[13-18].

Aging populations are heterogeneous, and their risk factor analyses differ from those for younger people. Their characteristics are influenced by historical events that mark the

different birth cohorts, survival biases and gender differences[19]. The development of these diseases affects individuals differently, with less frequency and severity in those with healthier trajectories and daily life. Therefore, effective CVD prevention will only be achieved by improving the overall risk profile of individuals[14].

In Brazil, few studies[14,16,19-24] have sought to explore the overlapping nature of cardiovascular risk factors in the elderly population, and not all of them are population-based. There is no consensus in their findings with regard to the sociodemographic profile that is more likely to accumulate these factors.

Thus, the lack of this type of information was the motivation behind this study, because identifying more susceptible groups allows for more effective preventive actions. It is believed that the analysis of risk factors simultaneously can support the construction of more specific public policies for the elderly population, as it is known that many behaviors manifest specific combination patterns. Therefore, the aim of this study was to investigate the prevalence of simultaneity of modifiable cardiovascular risk factors (CVRF) and their association with sociodemographic characteristics in elderly participants of a population-based study in Florianópolis, Santa Catarina.

METHOD

This is a cross-sectional population-based study conducted with data from the Epidemiological Study of Health Conditions of the Elderly of Florianópolis, Santa Catarina (EpiFloripa Elderly 2009–2010), which aims to understand the living and health conditions of the elderly population of Florianópolis. In 2009, Florianopolis, which is the capital of the state of Santa Catarina, had a total population aged 60 and over corresponding to 10.8% of the population,[25] had high life expectancy at birth[25] and a high Municipal Human Development Index (HDI-M)[26].

The sample size calculation considered an expected prevalence of 50%, a 4% error, a 95% confidence interval (95%CI), an estimated cluster design effect equal to 2, plus 20% for losses and 15% to test associations. The sample was selected by clusters in two stages. In the first stage, the urban census tracts of the municipality were selected and then, in the second, the households were selected according to methodology that has been previously detailed in other studies[27,28]. Data collection took place between September 2009 and June 2010 by trained interviewers using a structured questionnaire in the form of face-to-face interviews by means of Personal Digital Assistants (PDA). The scientific rigor in obtaining reliable data was insured through the construction of a data collection manual, interviewer training, a pilot study, consistency analysis and data quality control.

For the outcome, modifiable risk factors for CVD were defined as those at the first causal level: insufficient fruit, legume, and vegetable (FLV) intake, insufficient physical activity during leisure time, alcohol abuse, and smoking. Thus, the dependent variable resulted

from the sum of the presence of these factors. Therefore, a combinatorial analysis was performed and a simultaneity score was created to evaluate the possible combinations. The score ranged from 0 to 4 (0 = no exposure; 1 = one-factor exposure; 2 = two-factor exposure; 3 = three-factor exposure; 4 = four-factor exposure).

Insufficient intake of FLV was assessed by the questionnaire that is used by the Surveillance of Risk Factors and Protection for Chronic Diseases through Telephone Surveys (VIGITEL)[29,30]. Individuals who reported a daily intake ≤ 3 times/day of fruits and ≤ 2 times/day of legumes and vegetables on at least 5 days a week were considered to have a risk factor. This variable was collected as such due to the difficulties of transmitting the concept of portions to the interviewees.

Insufficient physical activity during leisure time was verified by the long version of the International Physical Activity Questionnaire (IPAQ) and categorized as: insufficiently active (0 to 149 minutes of physical activity/week) and physically active (≥ 150 minutes of physical activity/week)[31].

Alcohol abuse was assessed in accordance with the first three questions in The Alcohol Use Disorders Identification Test (AUDIT) questionnaire,[32] and was defined as the consumption of three or more servings of alcohol on a typical day, or five or more servings of alcohol at once (episodic overuse or binge drinking). Non-consumption or moderate alcohol consumption were grouped and only the abuse category was considered to be a risk.

Smoking was assessed by the question: "Do you smoke or have you ever smoked cigarettes?" and the participants were classified as a non-smoker, a former smoker or a current smoker. For the purposes of the analysis, the non-smoker and former smoker categories were grouped and the current smoker category was considered to be at risk.

The independent variables used were: gender, age (in categories and in complete years), self-reported skin color[25] (white and non-white), education (in categories and in completed years of study), who you live with (alone, spouse, other family members), monthly household income *per capita* in quartiles (1st quartile: ≤ R $ 327.50; 2nd quartile: R $ 327.50 to 700; 3rd quartile: R $ 700 to 1,500; 4th quartile:> R $ 1,500) and current paid work (yes, no).

An analysis of clusters was performed in order to evaluate concurrency between FRCV according to previous studies[24,33]. Cluster studies are recommended because the combination of behaviors does not demonstrate a linear and constant increase in CVD risk. The risk from the combinations can be increased or remain constant, as each behavior has an independent effect on CVD[8,3]. Thus, the expected prevalence (E) of each combination was calculated by multiplying the individual probability of each behavior based on the observed prevalence (O). And when the risk factor was absent among the combinations, it was multiplied by the inverse of its observed prevalence (1 - O). Therefore, when the ratio of observed to expected (O / E) was greater than 1, the existence of an aggregation or cluster was indicated and assumed to have occurred independently.

Absolute and relative frequencies were calculated, as well as prevalence and 95%CI of each variable in isolation, and in relation to the outcome. Bivariate analysis was performed by applying Pearson's χ^2 test. A multivariate analysis was performed using Poisson regression, in which all independent variables were included in the adjusted model in order to evaluate the effect of all the exposure variables on outcome[34]. The variables of age and education level were used continuously in the analyzes because it is easier to communicate their results in terms of public health. Observed prevalence and expected prevalence analyses were performed using Microsoft Excel 2010 and the other analyses were conducted using the Stata/SE 13.0 statistical program (Stata Corp., College Station, United States).

The project was approved by the Human Research Ethics Committee of the Universidade Federal de Santa Catarina (protocol No. 352/2008) and the participants were asked to sign an Informed Consent Form (ICF).

RESULTS

Of the 1,911 eligible individuals, 1,705 elderly people were interviewed. Of these, elderly people without complete data for all of the selected variables were excluded, and there were losses due to the construction of the outcome variable.

Thus, 1,553 elderly individuals were analyzed, with a mean age of 70.7 years old (± 8.0 years). The sample consisted predominantly of female, white, married women, aged between 60 and 69 years old, who had a low level of education, according to Table 1. Only 8.6% of the sample had no CVRF and 1.1% presented all factors concomitantly. However, 57.7% of these elderly individuals had at least 2 CVRF and thus lived with the simultaneous risk factors for CVD.

The bivariate analysis of sociodemographic variables with the outcome showed significant differences between the proportions of the CVRF groups in relation to sex, age and education.

In the total sample, insufficient physical activity during leisure time was the most prevalent CVRF (69.1%). Among men, the most prevalent CVRF was insufficient intake of FVC (67.2%) and among women, insufficient physical activity during leisure time (73.4%). Alcohol abuse and smoking were more prevalent among men. Still, there was a statistically significant difference between sexes in relation to all CVRF ($p \leq 0.001$), except for insufficiency in FLV consumption ($p = 0.972$) (Figure 1).

Concerning risk factor combinations, Table 2 shows the results of the prevalence of observed and expected aggregate factors of the four risk factors, stratified by sex. The highest prevalence observed in both women and men was insufficient physical activity with insufficient intake of FLV, being 46.4 and 28.1%, respectively. The observed prevalence of the 4 simultaneous factors was higher among men (2.5%) when compared to women (0.3%). The absence of the 4 risk factors was similar between the sexes, with a prevalence of 8.8% among women and 8.1% among men.

Table 1. Sample distribution and simultaneity of modifiable risk factors for cardiovascular disease according to independent variables. EpiFloripa Idoso. Florianópolis, SC, 2009-2010 (n = 1,553).

Variable# (n) %	n	0 factors n (%)	n	1 factor n (%)	n	2 factors n (%)	n	3 factors n (%)	n	4 factors n (%)
		134 (8,6)		523 (33,7)		718 (46,2)		161 (10,4)		17 (1,1)
		% (95%CI)		% (95%CI)		% (95%CI)		% (95%CI)		% (95%CI)
Sex (1,553) *										
Female 1,012 (65.2)	90	8.8 (6.1 – 12.5)	350	33.5 (29.7 – 37.5)	508	50.9 (46.7 – 55.1)	61	6.2 (4.7 – 8.3)	03	0.3 (0.1 – 1.2)
Male 541 (34.8)	44	8.4 (5.4 – 12.7)	173	33.5 (28.4 – 39.0)	209	38.1 (32.5 – 44.1)	99	16.8 (12.8 – 21.7)	14	3.0 (1.7 – 5.1)
Skin color (1,513)										
White 1,296 (85.6)	113	8.5 (6.2 – 11.6)	429	33.2 (30.0 – 36.6)	604	46.6 (42.1 – 51.1)	136	10.3 (8.1 – 13.0)	14	2.5 (0.7 – 2.0)
Black/others 217 (14,4)	18	10.0 (5.3 – 18.0)	76	33.2 (30.2 – 36.4)	95	46.2 (42.2 – 50.2)	25	10.3 (8.2 – 12.8)	03	1.3 (0.8 – 2.1)
Age (1,522)*	134	69.0 (7.1)£	523	70.5 (7.9)£	718	71.8 (8.4)£	161	67.7 (6.5)£	17	64.7 (6.2)£
60 to 69 years 776 (49.4)	74	9.4 (6.5 – 13.3)	245	33.1 (29.1 – 37.3)	324	42.2 (37.8 – 46.8)	106	12.7 (9.7 – 16.6)	14	2.3 (1.4 – 4.0)
70 to 79 years 567 (36.1)	49	9.3 (6.3 – 13.5)	201	35.1 (30.4 – 40.1)	264	46.2 (40.2 – 52.3)	45	9.0 (6.6 – 12.2)	02	0.2 (00 – 0.9)
80 years or more 227 (14.5)	11	4.4 (2.1 – 8.9)	76	30.6 (23.7 – 38.4)	128	61.5 (53.5 – 68.9)	09	3.0 (1.5 – 6.2)	01	0.3 (00 – 2.7)
Lives (1,539)										
Alone 241 (15.7)	23	10.2 (4.6 – 20.8)	82	34.5 (26.2 – 43.9)	109	46.5 (37.6 – 55.6)	24	7.9 (4.9 – 12.3)	03	0.8 (0.2 – 2.6)
With a spouse 598 (38.8)	59	9.1(5.8 – 13.9)	193	31.5 (27.7 – 35.6)	263	45.1 (40.4 – 49.9)	70	11.8 (8.7 – 15.8)	10	2.3 (1.2 – 4.3)
With family members 700 (45.5)	52	7.9 (5.5 – 11.2)	241	34.7 (30.7 – 38.9)	338	47.3 (42.3 – 52.4)	65	9.3 (7.0 – 12.3)	04	0.5 (0.1 – 1.6)

Continue...

Table 1. Continuation.

Variable# (n) %	n	0 factors n (%)	n	1 factor n (%)	n	2 factors n (%)	n	3 factors n (%)	n	4 factors n (%)
		134 (8,6)		523 (33,7)		718 (46,2)		161 (10,4)		17 (1,1)
		% (95%CI)		% (95%CI)		% (95%CI)		% (95%CI)		% (95%CI)
Education level* (1,544)	134	10.3 (6.1)[£]	521	8.4 (6.0)[£]	712	7.5 (5.3)[£]	160	9.0 (5.8)[£]	17	8.0 (10.3)[£]
12 years or + 338 (21.7)	55	12.6 (9.4 – 16.7)	134	37.5 (30.7 – 44.9)	133	37.4 (29.9 – 45.6)	47	11.8 (8.2 – 16.7)	03	0.4 (0.1 – 1.5)
9 to 11 years 222 (14.2)	19	7.8 (4.5 – 13.2)	72	33.4 (25.1 – 42.9)	94	45.0 (36.2 – 54.1)	29	11.0 (6.8 – 17.1)	03	2.6 (0.7 – 8.4)
5 to 8 years 283 (18.1)	24	10.4 (5.4 – 19.3)	86	25.9 (20.5 – 32.1)	140	49.9 (42.9 – 57.0)	35	11.8 (7.5 – 18.0)	05	1.8 (0.7 – 4.6)
0 to 4 years 717 (45.0)	36	5.6 (3.4 – 9.0)	229	34.4 (30.1 – 38.9)	345	50.8 (45.8 – 55.9)	49	7.8 (5.7 – 10.7)	06	1.1 (0.4 – 2.8)
Income (1l,512)										
1st quartile (380)	47	11.8 (7.8 – 17.4)	128	34.3 (27.5 – 41.7)	150	40.5 (33.8 – 47.5)	50	12.0 (7.8 – 18.0)	04	1.3 (0.4 – 4.4)
2nd quartile (391)	44	10.7 (6.9 – 16.2)	128	34.2 (27.8 – 41.3)	173	43.6 (36.4 – 51.1)	39	9.3 (6.1 – 14.0)	06	1.9 (0.7 – 4.9)
3rd quartile (379)	22	7.1 (4.6 – 10.9)	139	34.6 (28.2 – 41.6)	176	47.2 (40.4 – 54.1)	36	9.1 (6.2 – 13.2)	06	1.7 (0.7 – 4.0)
4th quartile (362)	19	4.7 (2.6 – 8.2)	118	33.8 (30.7 – 37.0)	194	45.9 (42.0 – 49.9)	29	10.0 (8.0 – 12.4)	01	1.37 (0.8 – 2.2)
Works (1,553)										
Yes 204 (13.2)	12	8.2 (4.2 – 15.3)	76	38.0 (29.0 – 47.9)	78	37.5 (28.3 – 47.6)	35	15.2 (10.4 – 21.7)	03	1.0 (0.3 – 3.3)
No 1,346 (86.8)	122	8.7 (6.3 – 11.9)	447	32.8 (29.7 – 36.1)	638	47.6 (43.4 – 51.8)	125	9.3 (7.3 – 11.8)	14	1.3 (0.8 – 2.3)

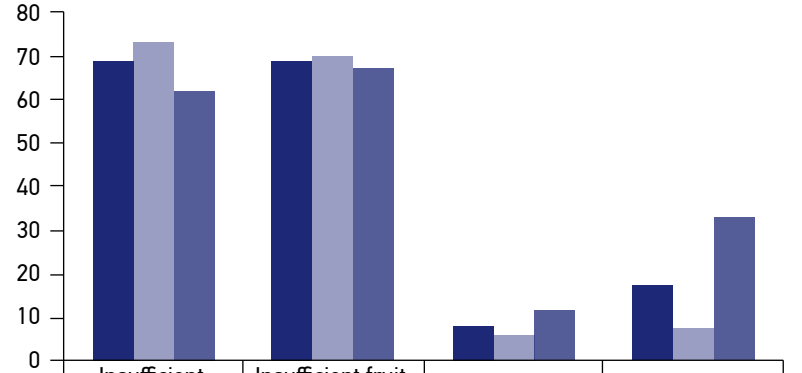
[#]Differences between the groups (p-value estimated by the χ^2 test); 95%CI: 95% confidence interval; *p <0.05; [£]average (standard deviation).

In both sexes, aggregation (O / E> 1.0) of the 4 risk factors was observed. For the aggregation of 3 factors, insufficient physical activity during leisure time, smoking, and alcohol abuse (O / E = 4.00.) Insufficient consumption of FLV, smoking, and alcohol (O / E = 3.75) among women stand out. Among men, insufficient consumption of FLV, smoking and alcohol (O / E = 2.85) stand out. The highest aggregations of 2 risk factors were observed between smoking and alcohol consumption (6.66) and insufficient physical activity with insufficient FLV consumption (1.05) for women. Among men, the only combination that presented a cluster was the insufficient physical activity with insufficient consumption of FLV (1.14).

In the multivariate analysis, according to Table 3, it was demonstrated that elderly men were 11.0% more likely to accumulate risk factors simultaneously compared to females. In addition, each additional year of study provided 4.0% less probability, showing that education is a protective factor against concurrent CVRD accumulation in this population.

DISCUSSION

The WHO and the Brazilian Society of Cardiology have set a goal of reducing NCDs by 25% by the year 2025[6,35]. This study stands out for being one of the few national



	Insufficient physical activity during leisure-time* (%)	Insufficient fruit, legume and vegetable intake (%)	Tobacco* (%)	Alcohol* (%)
Total	69.1	68.7	8.3	17.3
Female	73.4	69.5	6.2	7.7
Male	61.8	67.2	11.9	32.5

*Statistically significant difference between the sexes regarding cardiovascular risk factors ($p \leq 0.001$).

Figure 1. Prevalence of risk factors for cardiovascular disease in the total sample and according to sex. EpiFloripa Idoso. Florianópolis, SC, 2009-2010 (n = 1,553).

population-based to research the prevalence and simultaneity of risk factors for the development of these morbidities among the elderly population.

It is worth noting that the high level of simultaneity of factors in almost 60% of the sample. Furthermore, only 8.6% of the elderly did not present any risk behavior. Still, the occurrence of simultaneity and risk factor combinations showed differences between the sexes and education level proved to be an important protective factor.

Gender inequalities in the standard of self-care are already established in the literature and indicate that females pay more attention to their health. Women access services more and consider their health more negatively, reporting a higher number of chronic diseases. Historically, the values that are part of male culture include health risk behaviors that consider men to be invulnerable to illness. Thus, when they seek

Table 2. Prevalence of combinations of the four risk factors for cardiovascular disease, stratified by sex. EpiFloripa Idoso. Florianópolis, SC, 2009-2010 (n = 1,553).

N	PA	FLV	SM	AA	Female			Male		
					O (%)	E (%)	O / E (95%CI)	O (%)	E (%)	O / E (95%CI)
4	+	+	+	+	0.3	0.2	1.50 (0.78 – 2.22)	2.5	1.6	1.56 (0.56 – 2.56)
3	_	+	+	+	0.3	0.08	3.75 (2.62 – 4.88)	0.9	0.9	1.00 (0.20 – 1.80)
3	+	_	+	+	0.4	0.1	4.00 (2.83 – 5.17)	2.0	0.7	2.85 (1.51 – 4.21)
3	+	+	_	+	3.1	3.6	0.86 (0.32 – 1.40)	12.2	11.8	1.03 (0.22 – 1.85)
3	+	+	+	_	2.1	2.9	0.72 (0.23 – 1.22)	3.3	3.3	1.00 (0.20 – 1.80)
2	_	_	+	+	0.2	0.03	6.66 (5.16 – 8.18)	0.1	0.4	0.25 (0.01 – 0.65)
2	_	+	_	+	1.1	1.3	0.84 (0.31 – 1.38)	6.4	7.3	0.87 (0.13 – 1.63)
2	_	+	+	_	0.5	1.05	0.47 (0.07 – 0.88)	0.7	2.0	0.35 (0.01 – 0.82)
2	+	_	_	+	0.9	1.6	0.56 (0.12 – 1.00)	2.2	5.8	0.38 (0.01 – 0.87)
2	+	_	+	_	0.7	1.2	0.58 (0.14 – 1.03)	1.1	1.6	0.69 (0.02 – 1.35)
2	+	+	_	_	46.4	44.1	1.05 (0.45 – 1.65)	28.1	24.6	1.14 (0.29 – 2.00)
1	_	_	_	+	1.1	0.5	2.20 (1.33 – 3.07)	5.3	3.5	1.51 (0.53 – 2.50)
1	_	_	+	_	0.4	0.4	1.00 (0.42 – 1.58)	0.7	1.0	0.70 (0.03 – 1.37)
1	_	+	_	_	13.5	16.0	0.84 (0.31 – 1.38)	13.1	15.2	0.86 (0.12 – 1.60)
1	+	_	_	_	19.3	19.3	1.00 (0.42 – 1.58)	12.7	12.0	1.06 (0.24 – 1.88)
0	_	_	_	_	8.8	7.0	1.25 (0.60 – 1.91)	8.1	7.4	1.09 (0.26 – 1.93)

N: number of cardiovascular risk factors; PA: insufficient physical activity during leisure time; FLV: insufficient consumption of fruits, legumes and vegetables; SM: smoking; AA: alcohol abuse; (+): present risk factor; (-): missing risk factor; O: observed prevalence; E: expected prevalence; O/E: observed/expected ratio; 95%CI: 95% confidence interval.

health services, they access specialized care and already have more lethal complications and diseases[36-38].

In this study, the most prevalent CVRF was insufficient physical activity during leisure time (69.1%), with a difference between the sexes. In most studies conducted with the elderly, there was a lower percentage of low levels of physical activity, ranging between 37.6 and 60.1%[14-16,21,24]. Among women, the most prevalent factor was insufficient physical activity during leisure time (73.4%) and for men it was insufficient intake of FVC (67.2%), in addition to alcohol abuse (32.5%) and smoking (11.9%) that had a higher prevalence.

Table 3. Crude and adjusted analysis between the simultaneity of cardiovascular risk factors and sociodemographic variables in the elderly. EpiFloripa. Florianópolis, SC, 2009-2010 (n = 1,553).

Variable	Crude Analysis		Adjusted Analysis	
	PR (95%CI)	Value p*	PR (95%CI)[a]	p*
Sex				
Female	1.0		1.0	
Male	1.10 (1.03 – 1.18)	0.005	1.11 (1.03 – 1.19)	0.006*
Race				
White	1.0		1.0	
Black/others	0.99 (0.89 – 1.11)	0.983	0.97 (0.87 – 1.08)	0.660
Age (in full years)	0.99 (0.98 – 1.00)	0.514	0.99 (0.98 – 100)	0.263
Lives				
Alone	1.0		1.0	
With a spouse	1.07 (0.96 – 1.20)	0.182	1.03 (0.91 – 1.16)	0.631
With family	1.03 (0.94 – 1.13)	0.480	0.98 (0.88 – 1.10)	0.812
Education level (in school years completed)	0.97 (0.94 – 1.00)	0.077	0.96 (0.93 – 0.99)	0.038*
Income (quartiles)				
4th	1.0		1.0	
3rd	1.00 (0.88 – 1.13)	0.941	0.98 (0.85 – 1.12)	0.788
2nd	1.04 (0.93 – 1.16)	0.425	1.02 (0.89 – 1.17)	0.779
1st	1.07 (0.96 – 1.19)	0.182	1.04 (0.90 – 1.21)	0.471
Paid work				
Yes	1.0		1.0	
No	0.99 (0.89 – 1.09)	0.885	0.99 (0.90 – 1.08)	0.922

PR: prevalence ratio; 95%CI: 95% confidence interval; [a]analyses adjusted for all independent variables; *p <0.05.

These results were similar to other studies with the elderly population, in which women had a higher prevalence of physical inactivity[14,16,24], which may explain the higher rates of abdominal obesity and being overweight [14,16,21,22,24]. Men had a higher prevalence of alcohol consumption[14-16,21,24] and smoking[15,21,22].

Smoking among men relates to historical and cultural aspects, as this habit emerged as an essentially male behavior[39]. The decrease in this habit was confirmed by Freitas et al.[19] who, when following a cohort of the elderly, found that the prevalence of smoking decreased in the younger cohort compared to the oldest male cohort. This fact is in line with the decrease in smoking in Brazil due to strong anti-smoking public policies[40]. Alcoholism and smoking were also found by Senger et al.[41] with a higher prevalence among men, 11.7 and 20.8%, respectively. Among the alcoholics and smokers, there were people with less education, no income and those who ate only two meals a day, which indicates worse concomitant life habits. In other studies, there was no significant difference between the sexes in relation to physical inactivity[15], inadequacy in diet[22] and smoking[16].

With regard to simultaneity, there are few studies with the elderly population especially those that have similar design to the present study. Therefore, it is difficult to be able to make comparisons and examine differing results. In the present study, 57.7% of participants had two or more risk factors concomitantly. Oliveira's study[21] observed that the presence of two or more CVRF occurred in 81.7% of men and 88% of women, however, more than 10 risk factors were analyzed, which may explain the high rates found. Similarly, Ferreira *et al.*[16], when investigating elderly users of the Goiânia Public Health System, identified simultaneity in 87.3% of the sample, which can be explained by the fact that they use a health system. In population-based investigations[20,24], simultaneity was closer to that in this study, 59.9 and 50.9%, respectively. Data from China[15] and the United Kingdom[42,43] show much lower simultaneity, ranging from 18.7 to 25.0%, which leads us to reflect on cultural influences on lifestyle.

With regard to the combinations, insufficient physical activity together with the insufficient consumption of FLV were observed to be the most prevalent for both sexes. This fact demonstrates that there is usually an accumulation of risk behaviors in the first causal level, and the elderly who practice less physical activity tend to have a poor diet and vice versa, which may lead to weight gain and the development of cardiovascular disorders. A similar analysis[44] conducted with adults who also live in the city of Florianópolis identified a higher prevalence (30.6%) for this combination, suggesting that the tendency to accumulate these two harmful behaviors may continue over time.

The relation between lower levels of physical activity and a higher prevalence of obesity and vice versa is well known.[45,46]. In the Cruz et al. study[24], it was observed that physical inactivity plus excess weight was the most frequent grouping between the men (18.1%) and the women (30.7%). Still, they demonstrated that being inactive increases one's chance of being overweight, because physical inactivity leads to low energy expenditure.

The present investigation identified that being male increases one's probability of accumulating cardiovascular factors of risk by 11,0% and that each additional year of schooling diminishes the probability by 4.0%. A Chinese study[15] noted that among those with 3 or 4 risk factors, 93.0% were men. Some studies[16,21] with elderly Brazilians identified an association of simultaneity with females, and other studies[14,22,24] found no association according to sex. It is believed that these divergences can be found due to the great methodological diversity in relation to data collection, types and ways of classifying risk factors, as well as the socioeconomic and cultural influences among populations[47].

Similar studies[44,48] with the adult population of Florianópolis found that men were two and ten times more likely to simultaneously have three or four risk behaviors for NCDs than women, respectively. The same studies corroborate the present research in relation to education, which showed that less educated participants aggregated and accumulated more risk behaviors. It is worth noting the large difference found in the distribution of education level between the group without risk factors and the group with a risk factor. Among those without risk factors, 43.0% had high levels of education and among the group with 1 risk factor, 41.0% had low levels of education.

Schooling is an important tool in the search for a healthy lifestyle, both on an individual level, as it facilitates the understanding of educational messages related to health promotion, as well as in its connection with gaining a better socioeconomic status, by reinforcing the idea of the social determination of risk behaviors[49-51].

This study had some limitations: the cross-sectional design did not allow for causal inferences to be made; survival bias could have led to an underestimation of outcome prevalence; the existence of few studies on the subject that had the same population, and the methodological differences found, especially regarding the categorization of the outcome. In addition, a possible information bias cannot be ruled out, especially in the oldest elderly, and the sample loss in the construction of the outcome variable due to the lack of complete data in the database.

However, the following can be highlighted as strengths: the population-based sample from a well-structured cohort with a high response rate (89.2%), which allowed for the results to be extrapolated to the elderly population of Florianópolis. The measurement of the variables came from well-known and validated instruments. A multivariate analysis and an exploration of the types of combinations enriched the results, and interpretations of them.

CONCLUSION

The simultaneity of behaviors has similarities and differences in relation to phases of life, reflecting the heterogeneity of the aging process and providing evidence of factors that must be tackled together. However, these factors need to be addressed in different ways for people of different sexes and education levels.

Thus, we suggest that both individual clinical approaches and campaigns aimed at healthy aging public policies consider the simultaneity of risk factors and not only each factor in isolation. Specific assessment tools could be introduced in individual clinical approaches and a specific approach to aggregating CVR behaviors could be part of educational campaigns. This could lead to the dissemination of successful lifestyle change strategies and not just the repetition of instructions for a healthy life. Nevertheless, follow-up studies are recommended in order to identify changes in the intervention profile with these new strategies.

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