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ORIGINAL PAPER

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A prevalence study of current tobacco smoking in later life community and its association with sociodemographic factors, physical health and mental health status

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Abstract *Objective* Evaluate the frequency of current smoking in elderly people living in urban areas of Rio Grande do Sul, Brazil. *Methods* Cross-sectional design. A representative sample of 6,961 elderly, randomly selected subjects, living in a community, was examined to estimate the frequency of current tobacco smoking. Tobacco use was measured by means of a household questionnaire administered by trained interviewers that inquired about current tobacco use, sociodemographic characteristics, self-rated physical and health status. Mental health was evaluated using the Short Psychiatric Evaluation Schedule (SPES). *Results* The prevalence of tobacco use was 28.9% among men, 13.6% among women and 18.8% for both sexes. Male gender (OR = 3.25), low income (OR = 1.52), years of schooling (illiterate) (OR = 1.35), non-Protestant religion (OR = 2.17) and absence of physical exercise (OR = 1.21) presented positive and independent association with tobacco use. Presence of pulmonary disease (OR = 1.93) and mental distress (OR = 1.32) and absence of cardiac disease (OR = 1.51), high blood pressure (OR = 1.51) and diabetes (OR = 1.50) were independently associated with an increased chance of current tobacco use. Increasing age (OR = 0.93) and marital status (married) (OR = 0.66) presented independent and negative association with smoking. *Conclusion* Factors associated with an increased chance of tobacco smoking were: being men, illiterate, with lower income, presence of respiratory and mental disease, and absence of cardiac disease, high blood pressure and diabetes. Factors associated with a decreased risk of tobacco smoking were: aging, exercise, Protestant religion and marriage.

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SPPE 338

Introduction

Tobacco use has been largely associated with negative health events, contributing to mortality and morbidity due to many diseases such as lung cancer, respiratory diseases, cancers of the upper respiratory and digestive tracts, ischemic heart disease, stroke and peptic ulcer [50]. Cigarette smoking's linkage to such diseases is well known among middle-aged adults; however, the effects of smoking among the aged have been given less attention and are not extensively studied [11, 31, 36].

Elderly smokers are a special point of concern. They represent the fastest growing age group, in general started smoking before tobacco's negative adverse effects were known, and are less willing to quit [52].

Data about the prevalence of tobacco use among the elderly and the relationship of tobacco use with sociodemographic factors, morbidity and quality-of-life

measures are sparse and in general derived from adult-population studies. Surveys frequently include an insufficient number of elderly people and do not describe the response rate among them. Smoking prevalence among elderly men in such surveys ranges from 84.5% in Indonesia [12] to 11% in Australia [45] and among elderly women ranges from 26.1% in Tonga [48] to 0.4% in Kazakhstan [16]. Among surveys including only elderly samples, prevalence rates range from 25.9% among elderly individuals of both sexes living in Piedmont [9], to 13.9% among those living in Iowa [9] and 11% in Botswana [8]. In Brazil, tobacco use prevalence among the elderly ranges from 12.8% [29] to 58% [30].

The association between cigarette smoking and morbidity and quality of life among the elderly is not well documented, though there has been some work regarding morbidity due to cardiac disease [25, 31]. Association between cardiovascular disorders and smoking in the elderly has been a point of some controversy. Some studies indicate an association between tobacco smoking and cardiac disease, whereas others fail to show this connection [31, 36].

As regards the association between tobacco use with other diseases such as mental and physical disorders and measures of quality of life among the aged, information is sparse and inconsistent [11, 36]. The present study is an additional analysis undertaken as part of a large multidimensional investigation of health and living conditions of community-living older people in the southern state of Rio Grande do Sul, Brazil [21]. This investigation involved 14 university centres, which have been brought together to form a consortium under the initiative and support of the State Council on Aging (Conselho do Idoso-Secretaria do Trabalho, Cidadania e Ação Social-Governo do Estado do Rio Grande do Sul). In the first survey, the consortium established an overall picture of lifestyle, health and living conditions of the elderly. The aim of the present study is to evaluate the prevalence of current smoking in an urban elderly population and the association of current smoking with sociodemographic factors, physical health and mental health status. This report is based on data from this baseline survey.

Methods

Study population and sampling procedures

This cross-sectional investigation of persons over 60-year-old was based on a multistage, stratified random-sampling procedure. The first step was to draw a sample from nine homogeneous areas covering the whole state of Rio Grande do Sul, Brazil. The second step was to stratify the 333 municipalities into five categories according to basic economic activity and number of inhabitants. The proportion of each category in each homogeneous zone was calculated. The number of subjects in each stratum was computed to secure a representative proportion of elderly people in the community. Third, the municipalities were randomly selected proportionally in each stratum. The fourth step was to obtain a random sample of urban census areas for each municipality as supplied by the Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística; IBGE). Fifth, to get a sample of private households from every census area, a block was randomly selected and every eighth house was systematically visited. The selected household was visited in person by the interviewer. One respondent was randomly selected in each household in which there was more than one eligible person. Houses with no eligible person were replaced by the next neighbor.

Preliminary reports compared sample characteristics with official data from the IBGE in order to assure sample representativeness [21]. The household survey was conducted in 1995 and was approved by a local medical research ethics committee and university regulatory ethical committees.

Measures

All subjects willing to participate completed a face-to-face interview administered by trained health professionals in respondent homes. Proxy responses were not allowed. Training procedures involved 14 university teams trained together to assure homogeneity in collecting data. As we expected a high prevalence of illiteracy in our sample, health professionals were trained for interview administration and scoring procedures.

The questionnaire was a structured self-report instrument and inquired about sociodemographic characteristics and current smoking as well as physical and mental health status. The sociodemographic data collected were age, gender, marital status (bachelor/divorced/married/widowed), ethnicity (Caucasian/non-Caucasian), monthly household income in Brazilian minimum wages (1 Brazilian minimum wage [BMW] = U.S. $100), level of education in years of schooling, religion (Protestant/Catholic/other), origin (urban/rural), living alone or with another person and involvement in the work force. Health behavior such as exercise (yes/no) was also assessed. Subjects in this sample were also asked to self-rate their perception of their health as good (very good, good) or poor (regular, bad, very bad).

Smoking habits were assessed asking participants, "Do you currently smoke tobacco?" Answers for this question could be "Yes" or "No". Current smokers were defined as respondents reporting "Yes" to this question, with the aim of identifying widely defined tobacco use, either everyday or some day use, regardless of the amount of smoking. Health status was assessed through self-reporting and included questions about cardiac disease, respiratory disease, diabetes and arterial hypertension. Answers to those questions could be, "Yes, with prescription and/or a medical consultation"; "Yes, without prescription or a medical consultation"; "No"; or "Do not know". All questions were answered in a yes (yes with prescription or yes without prescription)/no/do-not-know fashion.

The psychiatric investigation conducted at the time of the interview was carried out by lay technical research assistants. The Short Psychiatric Evaluation Schedule (SPES) developed by Pfeifer [37] is an easily usable 15-item screening questionnaire designed for conducting epidemiological studies in the general elderly population. This 6-item abbreviated version of the SPES (Short-SPES) was used in the present study. The items were as follows: "Does it seem that no one understands you?" "Have you had periods of days, weeks, or months when you couldn't take care of things because you couldn't 'get going'?" "Are you happy most of the time?" "Are you troubled by your heart pounding and by a shortness of breath?" "Do you feel weak all over much of the time?" and "Do you certainly feel useless at times?" The SPES was included as a psychiatric assessment instrument in the Older Americans Resources and Services (OARS) multidimensional methodology, [13] and its abbreviated version (Short-SPES) proved to be sensitive for detecting depressive and anxiety states [4], without necessarily indicating a diagnosable disorder. This Short-SPES has

comparable validity to the validated 15-item version, taking as a gold standard the DSM-III criteria by eliciting further questions listed in the Clinical Interview Schedule (CIS) to fulfill DSM-III criteria [5, 17]. The validity coefficients are not affected by sociodemographic variables and particularly age, thus avoiding an age test bias. Mental health evaluation is based on a 30-day period, focusing primarily on current emotional status. Each question demands a yes/no answer regarding aspects of the mental functioning status of the elderly person. The total score is calculated by adding the number of positive answers in the test. The Short-SPES has a potential score ranging from 0 to 6; the higher the score, the worse the mental condition. The validity coefficients of the Short-SPES at the 0-to-1 and 2+ cut-off point were sensitivity 82% and specificity 77% [4].

Statistical analyses

We first determined the overall and by-gender group prevalence of current tobacco use (i.e., number of current tobacco cases divided by the total number of subjects and in a gender group divided by the total number in that gender group). Cross-tabulations were used to calculate frequencies and associations. Frequency comparisons between current tobacco use and each of the sociodemographic, mental and physical health variables were performed using χ^2 tests for categorical variables. To identify factors associated with the dependent variable tobacco use, logistic regression analysis was chosen. The initial model included all variables studied. Variables that were not associated with tobacco use ($P < 0.20$) were excluded from the final regression model. Furthermore, multi-collinearity between variables was tested but not found. The number of subjects used in the statistical analysis varies due to missing data for some variables. The statistical analysis and 95% confidence intervals (CIs) presented here were generated using the SPSS 10 program (SPSS Inc., Chicago, Ill.). Multivariate significance tests in the logistic regression analysis were carried out using the Hosmer-Lemeshow Goodness of Fit test. Statistical significance was evaluated using 2-tailed design-based tests. To control for Type I error inflation, we adopted a level of significance of $P < 0.05$.

Results

Response rate and sample characteristics

Due to computational problems (inconsistencies, discrepancies, duplications, missing data), all data concerning one area ($N = 858$) were unavailable for analysis. A total of 7,040 persons were approached in the first round. No proxy information was collected. Seventy-nine persons (1.1%) did not take part in the assessment mainly due to refusals, yielding an overall response rate of 99%, remarkably high, though similar to other surveys of this kind in developing countries [18]. So the final sample consists of 6,961 subjects.

The sample's sociodemographic characteristics are presented in Table 1. Women represented 66%, Caucasians 84.2% and youngest old (<79-year-old) 89.6% of the total sample. Educational level was low: 20.2% were illiterate and 64.7% had less than 5 years of schooling. Most of the sample were poor, and receiving less than 2 BMWs (64.2%).

The sample's health behavior and self-reported health problems are presented in Table 2.

Table 1 Sample's socio-demographic characteristics

Sample's socio-demographic characteristics	*N** (%)
Gender	
Men	2,355 (34)
Women	4,578 (66)
Age in years	
60–64	1,863 (26.9)
65–69	2,078 (30)
70–74	1,064 (15.3)
75–79	1,210 (17.4)
80+	719 (10.4)
Marital status	
Bachelor/divorced	827 (11.9)
Married	3,151 (45.5)
Widowed	2,954 (42.6)
Ethnicity	
Non-Caucasians	1,096 (15.8)
Caucasians	5,836 (84.2)
Income (in Brazilian Minimum Wages)	
≤2 BMW	4,318 (64.2)
>2 BMW	2,411 (35.8)
Education (years of schooling)	
Illiterate	1,393 (20.2)
<5 years	4,474 (64.7)
≥5 years	1,046 (15.1)
Origin	
Urban	2,355 (34.3)
Rural	4,510 (65.7)
Religion	
Catholic	5,245 (75.7)
Protestant	1,077 (15.5)
Other	497 (7.1)
None	112 (1.6)
Employment status	
Retired/homemaker	5,982 (86.4)
Working	938 (13.6)
Living arrangements	
Alone	1,054 (15.5)
Not alone	5,728 (84.5)

*Each variable shows different sizes due to missing information

Table 2 Sample's health behaviors and self reported health problems characteristics

Sample's health behaviors and self reported health problems characteristics	*N* (%)
Exercise	
Exercisers	2,607 (37.7)
Non-exercisers	4,315 (62.3)
Self-rated health	
Good	2,524 (36.5)
Impaired	4,397 (63.5)
Diabetes	
No	6,167 (89)
Yes	761 (11)
Cardiac disease	
No	5,202 (75)
Yes	1,732 (25)
High blood pressure	
No	3,525 (50.8)
Yes	3,408 (49.2)
Respiratory disease	
No	5,016 (72.4)
Yes	1,916 (27.6)
Mental health	
Non-cases	4,213 (60.8)
Cases	2,721 (39.2)

Smoking prevalence

The prevalence of current tobacco use in our study (number of tobacco users/total sample) was 18.8% (95% CI, 16.9–20.8). Prevalence rates were higher among men than women (28.9 vs. 13.6%, $P < 0.001$) and declined with increasing age. Among the oldest old (80-year-old and over), the percentage of current tobacco use was significantly lower than among the youngest old (79-year-old and younger) (9.7 vs. 19.8%, $P < 0.001$).

Rates of tobacco smoking were higher among the less educated (24.6% for illiterate vs. 16.9% for literate, $P < 0.001$), non-Caucasians (27.1% for non-Caucasians vs. 17.2% for Caucasians, $P < 0.001$) and those with lower income (19.7% for those with less than 2 BMWs vs. 16.8% for those with more than 2 BMWs, $P = 0.003$). Marital status was also related to smoking: unmarried, divorced and separated individuals were significantly more likely to be tobacco smokers than married individuals (27.7 vs. 19.3%, $P < 0.001$). The percentage with tobacco use was also significantly higher among subjects currently working (26.4% for those working vs. 17.6% for those not involved in the workforce, $P < 0.001$).

Religious practice, namely being a Protestant, reduced the likelihood of tobacco use (19.8% for Catholics vs. 10.2% for Protestants, $P < 0.001$).

Origin (rural/urban) ($P = 0.372$), living arrangements (alone/not alone) ($P = 0.819$), exercise (exercisers/non exercisers) ($P = 0.068$) and self-rated health conditions (good/poor) ($P = 0.742$) were not related to tobacco use at a significant level.

Bivariate analyses looking for associations between health problems and tobacco use indicate that elderly individuals reporting cardiac disease (present 12.9 vs. absent 20.7%, $P < 0.001$), high blood pressure (present 14.5% vs. absent 23%, $P < 0.001$) and diabetes (present 11.4 vs. 19.7%, $P < 0.001$) had lower rates of smoking compared to those who did not report those conditions. However, respiratory problems (present 26.6% vs. absent 15.8%, $P < 0.001$) and psychiatric morbidity (present 20% vs. absent 18%, $P = 0.034$) were significantly related to higher rates of tobacco use.

Table 3 shows the relationship between tobacco use and sociodemographic, physical health and mental health conditions.

A logistic regression model was developed to identify factors independently related to current tobacco use. Table 4 shows the final results of the analyses with odds ratios (ORs) and 95% CIs for current smoking and sociodemographic and health status variables. Several sociodemographic variables were related strongly to tobacco use: male sex, illiteracy, low income and non-Protestant religious affiliation were independently related to an increased likelihood of being a smoker. Increasing age and being married were independently related to a decreased chance of tobacco use.

Table 3 Relationship between tobacco use and socio-demographic and physical and mental health *N* (%)

Variable	Tobacco use		
Gender	No *N* (%)	Yes *N* (%)	Total
Men	1,674 (71.1)	681 (28.9)	2,355
Women	3,957 (86.4)	621 (13.6)	4,578
	P-value < 0.001		
Age			
60–64	1,367 (73.4)	496 (26.6)	1,863
65–69	1,670 (80.4)	408 (19.6)	2,078
71–74	895 (84.1)	169 (15.9)	1,064
75–79	1,051 (86.9)	159 (13.1)	1,210
80+	649 (90.3)	70 (9.7)	719
	P-value < 0.001		
Marital status			
Bachelor/divorced	598 (72.3)	229 (27.7)	827
Married	2,542 (80.7)	609 (19.3)	3,151
Widowed	2,492 (84.4)	462 (15.6)	2,954
	P-value < 0.001		
Ethnicity			
Non-Caucasians	799 (72.9)	297 (27.1)	1,096
Caucasians	4,831 (82.8)	1,005 (17.2)	5,836
	P-value < 0.001		
Income			
≤2 BMW	3,466 (80.3)	852 (19.7)	4,318
>2 BMW	2,006 (83.2)	405 (16.8)	2,411
	P-value = 0.003		
Education			
Illiterate	1,050 (75.4)	343 (24.6)	1,393
<5 years	3,697 (82.6)	777 (17.4)	4,474
≥5 years	869 (83.1)	177 (16.9)	1,046
	P-value < 0.001		
Origin			
Urban	1,926 (81.8)	429 (18.2)	2,355
Rural	3,647 (80.9)	863 (19.1)	4,510
	P-value = 0.37		
Religion			
Catholic	4,200 (80.2)	1,039 (19.8)	5,239
Evangelist	966 (89.8)	110 (10.2)	1,076
	P-value < 0.001		
Exercise			
Exercisers	2,147 (82.3)	460 (17.7)	2,607
Non-exercisers	3,476 (80.5)	839 (19.5)	4,315
	P-value = 0.07		
Employment status			
Retired/homemaker	4,930 (82.4)	1,052 (17.6)	5,982
Working	690 (73.6)	248 (26.4)	938
	P-value < 0.001		
Living arrangements			
Alone	853 (80.9)	201 (19.1)	1,054
Not alone	4,656 (81.3)	1,072 (18.7)	5,728
	P-value = 0.82		
Self-rated health			
Good	2,045 (81)	479 (19)	2,524
Poor	3,578 (81.4)	819 (18.6)	4,397
	P-value = 0.74		
Diabetes			
No	4,954 (80.3)	1,213 (19.7)	6,167
Yes	674 (88.6)	87 (11.4)	761
	P-value < 0.001		
Cardiac disease			
No	4,123 (79.3)	1,079 (20.7)	5,202
Yes	1,509 (87.1)	223 (12.9)	1,732
	P-value < 0.001		
High blood pressure			
No	2,716 (77)	809 (23)	3,525
Yes	2,915 (85.5)	493 (14.5)	3,408
	P-value < 0.001		

Table 3 Continued

Variable	Tobacco use		
Respiratory disease			
No	4,223 (84.2)	793 (15.8)	5,016
Yes	1,407 (73.4)	509 (26.6)	1,916
	P-value < 0.001		
Mental health			
Non-Cases	3,456 (82)	757 (18)	4,213
Cases	2,176 (80)	545 (20)	2,721
	P-value = 0.03		

Qui-square test, d*f* = 1, *BMW* Brazilian Minimum Wages

In the multivariate analyses, exercise was independently related to tobacco use. Elderly individuals who do not exercise had a 21% higher chance of smoking than exercisers.

Self-rated health conditions, such as cardiac disease, high blood pressure, diabetes, and respiratory and mental distress were all independently related to smoking conditions. Elderly individuals with cardiac disease, diabetes and high blood pressure were less likely to smoke. Those with respiratory disease and mental distress carried a higher chance of smoking.

Two social characteristics interact: religiosity and ethnicity. Non-Caucasians and non-Protestants were twice as likely to be smokers as other subjects (95% CI, 1.2–3.7).

Discussion

Current tobacco use rates for both sexes (18.8%) and among men (28.9%) and women (13.6%) in this sample indicate that smoking is still a common practice among the elderly. The prevalence of elderly tobacco use among elderly individuals of both sexes was similar to that found among elderly Brazilians living in Bambuí (18.7%) [28] and in Albania (23.1%) [41]. Prevalence rates were lower than in China (32.4%) [19] and higher than Australia (10%) [45], Saudi Arabia (8%) [22], and Botswana (11%) [8], and among those aged 65–74-years-old in the United States (15.2%) [24].

Smoking rates were higher among men than among women and declined with increasing age. Lower prevalence among the oldest old and female elderly has been described in other surveys [31, 36]. Sociodemographic factors also associated with tobacco use in this sample were lower income, less schooling (illiteracy), being in the workforce, non-Protestant religion and marital status (unmarried/divorced).

Lower income and schooling have consistently been associated with tobacco use [14, 30, 39, 43, 44, 49]. In developing countries, the association between smoking and lower socioeconomic status is an important concern, since many elderly individuals live in poor socioeconomic conditions. In this sample, 20% of the elderly were illiterate and 64% received less than 2 Brazilian minimum wages, strengthening this concern.

The association between employment status (working) and tobacco use has been linked to social factors in work environments such as peer influence in the workplace and also to smoking as a way of coping with financial distress [47]. Again, poor socioeconomic conditions may contribute in different ways to smoking habits. Those with lower income may need to work until later in their lives, and those illiterate may have less chance to achieve better incomes and thus need to continue working after retirement.

Married elderly individuals had lower chances of using tobacco compared to those widowed. Those who were unmarried/divorced/separated had the same chance as those widowed. Findings regarding marital status and smoking have been subject to some controversy, varying between regions and interacting with other sociodemographic factors such as age and gender. In Saudi Arabia, smoking was more frequent among married individuals than among those in other marital status categories [22]. In Bambuí, unmarried

Table 4 Logistic Regression analysis of tobacco use and socio-demographic and physical and mental health factors among Brazilian elderly (*N* = 6961)

Variables	Coefficient	*P*-value	Odds ratio	95% Confidence interval
Gender	1.180	<0.001	3.25	2.80–3.79
Religion (non-Protestant)	0.774	<0.001	2.17	1.6–2.87
Respiratory disease (presence)	0.658	<0.001	1.93	1.67–2.22
Income (<2 BMW)	0.417	<0.001	1.52	1.26–1.82
High blood pressure (absence)	0.417	<0.001	1.52	1.31–1.76
Cardiac disease (absence)	0.413	<0.001	1.51	1.26–1.82
Diabetes mellitus (absence)	0.409	0.003	1.50	1.15–1.96
Schooling (illiterate)	0.297	0.023	1.35	1.04–1.74
Mental health (presence)	0.281	<0.001	1.32	1.14–1.54
Physical activity (non-exerciser)	0.191	0.008	1.21	1.05–1.39
Marital status (married)	−0.416	<0.001	0.660	0.56–0.78
Age	−0.065	<0.001	0.94	0.93–0.95
Interaction (Ethnicity × Religion)	0.730	0.01	2.07	1.19–3.61

Wald χ^2 tests with d*f* = 1
BMW Brazilian Minimum Wages

men but not unmarried women had a greater chance of being smokers [36]. Elderly widowed women with low schooling had higher smoking rates in Vietnam [23]. Social factors may play a role in this association. Married people may have greater social support, and this kind of support may help them quit smoking [36]. Among the unmarried elderly, loneliness and lack of social support may enhance tobacco use.

Religion and religious activities have been linked to smoking habits in some surveys [15, 32, 47]. People reporting greater participation in religious activities were less likely to be smokers in Ukraine, in Russia and among elderly individuals attending a health center in Washington, DC [15, 32, 47]. In this sample, Protestant religion was associated with lower rates of smoking among the elderly; this can be explained by the fact that Protestants frequently encourage weekly participation in religious activities and advocate abstinence from many substances, including tobacco.

Exercise was related to a lower chance of smoking even among the elderly, a finding consistent with results from other sources showing that smokers exercise less than nonsmokers [40, 42]. This association suggests that various negative health behaviors may coexist among the elderly, enhancing the risk of diseases with multifactor etiology such as cardiac diseases. Intervention strategies aimed at reducing one risk factor can positively influence others, and interventions aimed at reducing multiple risk factors may be particularly beneficial for treating health conditions among the elderly [34].

Tobacco use was associated with psychiatric distress as measured with the SPES, a finding consistent with other clinical and community-based studies [1, 6, 20, 26, 38, 46]. Among those aged 15 to 54-year-old and among those aged 18-year-old and over, psychiatric distress is associated with an increased chance of tobacco use, ranging from 1.6 [20] to 2 times higher [26]. In this sample of adults aged 60-year-old and over, psychiatric distress was associated with a 1.3-fold greater chance of smoking, suggesting the co-occurrence of those disorders in later life as well.

A positive association with respiratory disease and a negative association with cardiac disease, diabetes and high blood pressure were also observed in Canadian elderly, but were not found among Brazilian elderly living in Bambuí [31, 36]. Among the Canadian elderly, smoking was associated with a greater chance of respiratory disease and a lower chance of cardiac disease and high blood pressure [31]. In Bambuí, there was no significant association between tobacco use and self-related heart disease, high blood pressure and diabetes [36].

Smoking is a well-known cause of cardiovascular disease among the middle-aged [50, 51], but among the elderly evidence linking cardiac disease and tobacco use is sparse and conflicting [25].

The lack of a positive association between smoking and cardiac disease in this sample may be the result of differing mortality rates among smokers [31], selective survival of "non-susceptible" subjects, reducing smoke-related deleterious cardiac effects with increasing age [25] and higher rates of abstinence after a heart problem. Another possible interpretation is that the lack of heart problems may be considered as tacit permission to continue smoking. By way of contrast with other studies, in this sample tobacco use was not associated with self-perception of health (poor/good) [31, 36] or living arrangements (alone/not alone). Selective survival of healthier subjects and denial and underestimation of the deleterious effects of smoking on health may be related to the lack of association observed in this sample.

This study provides information about smoking status in a large sample, exclusively composed of elderly, with a response rate of 99%. To the best of our knowledge, this is the first Brazilian study of tobacco use in the elderly and is based on a sample of approximately 7,000 elderly subjects.

Several study limitations should be addressed: the cross-sectional design, in which information regarding physical health and tobacco use was based on self-report and sampling procedures, included only elderly individuals living in the community. Cross-sectional surveys do not allow for establishing causal relationships. However, our goal was to describe the prevalence of tobacco use among the Brazilian elderly and the factors associated with tobacco use, and for these objectives a cross-sectional survey represented one of the possible study designs.

Other potential limitations for cross-sectional surveys are selection bias and memory bias, which can be especially important among the elderly since they can forget some information about their health and health-related behaviors. Self-report of physical health problems has some advantages, in that it is cheaper, provides for investigating a great number of health problems and can be used in large samples. Disadvantages include relying on each individual's ability to give precise information and memory bias. This kind of bias can be especially troublesome among the elderly due to high rates of memory problems in this group [2]. Health interview surveys can yield reliable data on chronic illness, even when done in the absence of medical records [3, 33]. Accuracy is especially high for cardiac problems [3] and presence of high blood pressure and diabetes [2, 3, 33].

Self-reported smoking status without independent biological validation is another study limitation. The validity of self-reported smoking has been widely debated, and there is good evidence that this technique is reliable for estimating smoking status, being more accurate when questionnaires are interviewer-administered [35]. Another point for potential confounding is definition of current smoking status. In this survey we adopted a definition used previously in other works considering current smokers those

reporting smoking tobacco products at the time of the survey [10, 27, 32]. This definition allowed us to identify widely defined tobacco use, either everyday or some day use, regardless of the amount of smoking. Due to the characterization of smokers adopted, we were not able to categorize ex-smokers, which were excluded from the scope of this survey.

Health behaviors such as exercise practice were evaluated in a categorical way. Amount and type of physical activity (aerobic training and strength exercising) may have different impacts on tobacco use, a point to be further addressed in future surveys. Subjects in this survey were only those living in the community; those living in public or private housing for the elderly and nursing homes were excluded from the sample. Literature on smoking among nursing home residents is sparse, but evidence suggests that some of those elderly still use tobacco products [7]. This sampling procedure has generated prevalence rates exclusive to the elderly living in the community; future surveys should address smoking patterns among those living in long-term care facilities. Environmental influences and living conditions were not assessed in our survey and could be a potential aspect influencing smoking patterns in the community-living elderly. In a survey among elderly individuals attending a health center, living with another smoker predicted current tobacco use [47]. Living arrangements such as living with another smoker were not addressed in our survey and represent issues to be considered in the future, as some of these variables have been shown to be related to tobacco use among the elderly.

In summary, our data provide evidence that male sex, illiteracy, poor socioeconomic status with lower income and absence of cardiac disease increase the chance of tobacco smoking. The same finding comes with presence of respiratory and mental disease and absence of high blood pressure and diabetes. Factors associated with a decreased chance of tobacco use were aging, exercise, marital status (married) and religion (Protestant). Ethnicity, origin, employment status, living conditions and self-rated health were not independently associated with tobacco use.

References

1. Araya R, Gaete J, Rojas G, Fritsch R, Lewis G (2007) Smoking and common mental disorders: a population-based survey in Santiago, Chile. Soc Psychiatry Psychiatr Epidemiol [Epub ahead of print]. Avaiable online: doi:10.1007/s00127-007-0238-4
2. Beckett M, Weinstein M, Goldman N, Yu-Hsuan L (2000) Do health interview surveys yield reliable data on chronic illness among older respondents? Am J Epidemiol 151(3):315–323
3. Bergmann MM, Byers T, Freedman DS, Mokdad A (1998) Validity of self-reported diagnoses leading to hospitalization: a comparison of self-reports with hospital records in a prospective study of American adults. Am J Epidemiol 147(10):969–977
4. Blay SL, Mari JJ, Ramos LR, Ferraz MPT (1991) The use of the Clinical Interview Schedule for the evaluation of mental health in the aged community. Psychol Med 21:525–530
5. Blay SL, Ramos LR, Mari JJ (1988) Validity study of the Brazilian version of the OARS mental health screening questionnaire. J Am Geriatr Soc 36:687–692
6. Breslau N, Kilbey MM, Andreski P (1992) Nicotine withdrawal symptoms and psychiatric disorders: findings from an epidemiologic study of young adults. Am J Psychiatry 149(4):464–469
7. Carosella AM, Ossip-Klein DJ, Watt CA, Podgorski C (2002) Smoking history, knowledge, and attitudes among older residents of a long-term care facility. Nicotine Tob Res 4(2):161–169
8. Clausen F, Sandberg E, Ingstad B, Hjortdahl P (2000) Morbidity and health care utilizations among elderly people in Mmankgodi Village, Botswana. J Epidemiology Community Health 54:58–63
9. Colsher PL, Wallace RB, Pomrehn PR, LaCroix AZ, Cornoni-Huntley J, Blazer D, Scherr PA, Berkman L, Hennekens CH (1990) Demographic and health characteristics of elderly smokers: results from established populations for epidemiologic studies of the elderly. Am J Prev Med 6(2):61–70
10. Cox HS, Williams JW, de Courten MP, Chitson P, Tuomilehto J, Zimmet PZ (2000) Decreasing prevalence of cigarette smoking in the middle income country of Mauritius: questionnaire survey. BMJ 321(7257):345–349
11. Critchley J, Capewell S (2005) Smoking cessation for the secondary prevention of coronary heart disease (Cochrane Review). In: The Cochrane Library, Issue 2, 2005. Update Software, Oxford
12. Ganiwijaya T, Sjukrudin E, Backer GD, Suhana D, Brotoprawiro S, Sukandar H (1995) Prevalence of cigarette smoking in a rural area of West Java, Indonesia. Tob Control 4:335–337
13. George LK, Fillenbaum GG (1985) OARS methodology. A decade of experience in geriatric assessement. J Am Ger Soc 33:607–615
14. Gilmore AB, McKee M, Rose R (2001a) Prevalence and determinants of smoking in Belarus: a national household survey, 2000. Eur J Epidemiol 17:245–253
15. Gilmore AB, McKee M, Telishevska M, Rose R (2001b) Epidemiology of smoking in Ukraine, 2000. Prev Med 33(5):453–461
16. Gilmore A, Pomerleau J, McKee M, Rose R et al (2004) Prevalence of smoking in 8 countries of the former Soviet Union: results from the living conditions, lifestyles and health study. Am J Public Health 94(12):2177–2187
17. Goldberg DP, Cooper B, Eastwood MR, Kedward HB, Shepherd M (1970) A standardized psychiatric interview for the use in community surveys. B J Prev Soc Med 24:18–23
18. Hendrie HC, Osuntokun BO, Hall KS, Ogunniyi AO, Hui SL, Unverzagt FW, Gureje O, Rodenberg CA, Baiyewu, Musick BS (1995) Prevalence of Alzheimer's disease and dementia in two communities: Nigerian Africans and African Americans. Am J Psychiatry 152:1485–1492
19. Hu TW, Tsai YW (2000) Cigarette consumption in rural China: survey results from 3 provinces. Am J Public Health 90(11):1785–1787
20. Hughes JR, Hatsukami DK, Mitchell JE, Dahlgren LA (1986) Prevalence of smoking among psychiatric outpatients. Am J Psychiatry 143(8):993–997
21. IBGE (1997) Governo do Estado do Rio Grande do Sul. Os idosos do Rio Grande do Sul. Relatório de Pesquisa. Conselho Estadual do Idoso. Porto Alegre, CEI
22. Jarallah JS, al-Rubeaan KA, al-Nuaim AR, al-Ruhaily AA, Kalantan KA (1999) Prevalence and determinants of smoking in three regions of Saudi Arabia. Tob Control Spring 8(1):53–56
23. Jenkins CN, Dai PX, Ngoc DH, Kinh HV, Hoang TT, Bales S, Stewart S, McPhee SJ (1997) Tobacco use in Vietnam. Prevalence, predictors, and the role of the transnational tobacco corporations. JAMA 277(21):1726–1731
24. Kamimoto L, Easton AN, Maurice E, Husten CG, Macera CA (1999) Surveillance for five health risks among older adults – United States, 1993–1997. In: CDC Surveillance Summaries, December 17, 1999. MMWR 48(no. ss-8), pp 89–126
25. LaCroix AZ, Lang J, Scherr P, Wallace RB, Cornoni-Huntley J, Berkman L, Curb JD, Evans D, Hennekens CH (1991) Smoking and mortality among older men and women in three communities. N Engl J Med 324(23):1619–1625

26. Lasser K, Boyd JW, Woolhandler S, Himmelstein DU, McCormick D, Bor DH (2000) Smoking and mental illness: a population-based prevalence study. JAMA 284(20):2606–2610
27. Lau EM, Lee P, Lynn H, Sham A, Woo J (2003) The epidemiology of cigarette smoking in Hong Kong Chinese women. Prev Med 37(5):383–388
28. Lima-Costa MF, Barreto SM, Uchôa E, Firmo JOA, Vidigal PG, Guerra HL (2001) The Bambuí Health and Aging Study (BHAS): prevalence of risk factors and use of preventive health care services. Pan Am J Public Health 9(4):219–227
29. Lima-Costa MF (2004) A saúde dos adultos na região metropolitana de Belo Horizonte: um estudo epidemiológico de base populacional. Belo Horizonte, Nespe: Fiocruz / UFMG, 132p
30. Lolio CA, Souza JMP, Santo AH, Buchalla CM (1993) Prevalência de tabagismo em localidade urbana da região sudeste do Brasil. Rev Saúde Pública 27(4):262–265
31. Maxwell CJ, Hirdes JP (1993) The prevalence of smoking and implications for quality of life among the community-based elderly. Am J Prev Med 9:338–345
32. McKee M, Bobak M, Rose R, Shkolnikov V, Chenet L, Leon D (1998) Patterns of smoking in Russia. Tob Control 7:22–26
33. National Center for Health Statistics (1994) Evaluation of National Health Interview Survey diagnostic reporting. Vital Health Stat 2(120):1–116
34. Østbye T, Taylor DH, Jung SH (2002) A longitudinal study of the effects of tobacco smoking and other modifiable risk factors on ill health in middle-aged and old Americans: results from the Health and Retirement Study and Asset and Health Dynamics among the Oldest Old survey. Prev Med 34(3):334–345
35. Patrick DL, Cheadle A, Thompson DC, Diehr P, Koepsell T, Kinne S (1994) The validity of self-reported smoking: a review and meta-analysis. Am J Public Health 84(7):1086–1093
36. Peixoto SV, Firmo JO, Lima-Costa MF (2005) Factors associated to smoking habit among older adults (The Bambui Health and Aging Study). Rev Saude Publica 39(5):746–753
37. Pfeiffer E (1975) A short portable mental status questionnaire for the assessment of organic brain deficit in elderly patients. J Am Geriatr Soc 23:433–440
38. Pomerleau CS, Zucker AN, Stewart AJ (2003) Patterns of depressive symptomatology in women smokers, ex-smokers, and never-smokers. Addict Behav 28(3):575–582
39. Rani M, Bonu S, Jha P, Nguyen SN, Jamjoum L (2003) Tobacco use in India: prevalence and predictors of smoking and chewing in a national cross sectional household survey. Tob Control 12:e4
40. Santos AC, Barros H (2004) Smoking patterns in a community sample of Portuguese adults, 1999–2000. Prev Med 38:114–119
41. Shapo L, Gilmore AB, Coker R, McKee M, Shapo E (2003) Prevalence and determinants of smoking in Tirana city, Albania: a population-based survey. Public Health 117(4): 228–236
42. Smedslund G, Ahn DK (1998) Smoking initiation and cessation in Norway and the United States: a comparison of two cross-sectional surveys. J Subst Abuse 10(4):397–410
43. Steyn K, Bradshaw D, Norman R, Laubscher R, Saloojee Y (2002) Tobacco use in South Africans during 1998: the first demographic and health survey. J Cardiovasc Risk 9(3):161–170
44. Subramanian SV, Nandy S, Kelly M, Gordon D, Davey Smith G (2004) Patterns and distribution of tobacco consumption in India: cross sectional multilevel evidence from the 1998–9 national family health survey. BMJ 328(7443):801–806
45. White V, Hill D, Siahpush M, Bobevski I (2003) How has the prevalence of cigarette smoking changed among Australian adults? Trends in smoking prevalence between 1980 and 2001. Tob Control 12(Suppl 2):ii67–ii74
46. Wiecha JM, Lee V, Hodgkins J (1998) Patterns of smoking, risk factors for smoking, and smoking cessation among Vietnamese men in Massachusetts (United States). Tob Control 7:27–34
47. Williams CD, Lewis-Jack O, Johnson K, Adams-Campbell L (2001) Environmental influences, employment status, and religious activity predict current cigarette smoking in the elderly. Addict Behav 26(2):297–301
48. Woodward A, Newland H, Kinahoi M (1994) Smoking in the Kingdom of Tonga: a report from a national survey. Tob Control 3:41–45
49. Woollery T, Trosclair A, Husten C, Caraballo RC, Kahende J (2003) Cigarette smoking among adults—United States, 2001. MMWR 52(40):953–954
50. World Health Organization (WHO) (2002) The smoker's body. Tobacco Free Initiative, WHO, 2002. Available at: www.who.int/tobacco/resources/publications/en. Accessibility verified 18 November 2007
51. World Health Organization (WHO) (2007) Western Pacific Regional Office. Country profiles, tobacco or health 2000. WHO, 2000. Available at: www.wpro.who.int. Accessibility verified 18 November 2007
52. Yong HH, Borland R, Siahpush M (2005) Quitting-related beliefs, intentions, and motivations of older smokers in four countries: findings from the International Tobacco Control Policy Evaluation Survey. Addict Behav 30(4):777–788