

Factors associated with daily sitting time in a rural community-dwelling of older adults from southern Brazil

Fatores associados ao tempo sentado em idosos de uma comunidade rural do sul do Brasil

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ABSTRACT

The purpose of this study was to investigate the prevalence and associated factors with daily sitting time among older adults in a rural community in southern Brazil. This cross-sectional household-based study involved 477 subjects (≥ 60 years) of both sexes (2010-2011). Daily sitting time was estimated by questionnaire, and the sitting data were divided into two groups based on tertiles: (< 6 hours/day, and highest tertile: ≥ 6 hours/day). The explanatory variables were: sex, age, schooling, living arrangements, occupation throughout life, currently working, number of morbidities, falls, nutritional status, cognitive status, smoking and alcohol consumption. The Poisson's regression [prevalence ratio (PR) and confidence interval (CI) 95%] verified the association among explanatory variables and highest sitting tertile. According to the results, the mean daily sitting time was 5.5 ± 3.2 hours/day. The proportion of older adults within the highest tertile of daily sitting time was 43.8%. Adjusted analyses showed that being older (PR 1.02, CI95%:1.01-1.04), being male (PR1.23, CI95%: 1.04-1.45), living with other people (PR 1.38, CI95%:1.02-1.86), having worked in agriculture (PR 1.24 CI95%: 1.04-1.48), and not working (PR1.21, CI95%:1.02-1.44), each were positively associated with highest tertile of daily sitting time. The illiterate older adults (PR=0.70; 95% CI=0.55 - 0.89), subjects who had never smoked (PR 0.60, CI95%: 0.46-0.78) and those underweight (PR 0.49, CI95%: 0.30-0.79) were less likely to be in the highest tertile of daily sitting time (inverse association). In conclusion, the socio-demographic and lifestyle-related variables are associated with the highest tertile of daily sitting time.

KEYWORDS

Aging; Elderly; Sedentary Lifestyle; Epidemiology; Cross-sectional studies

RESUMO

Este estudo transversal, de base populacional e domiciliar, investigou a prevalência e os fatores associados ao tempo sentado em idosos de uma comunidade rural do sul do Brasil. Foram entrevistados 477 idosos (≥ 60 anos), de ambos os sexos, residentes no município de Antônio Carlos, estado de Santa Catarina (2010-2011). O tempo sentado (questionário) foi distribuído em tercís, sendo considerado dois grupos: < 6 horas/dias e; ≥ 6 horas/dia (maior tercís). As variáveis explanatórias foram sexo, idade, saber ler e escrever, arranjo familiar, ocupação ao longo da vida, trabalho atual, número de morbidades, quedas, estado nutricional, estado cognitivo, tabagismo e consumo de bebidas alcoólicas. A Regressão de Poisson [razão de prevalência (RP) e intervalo de confiança (IC) 95%] foi usada para verificar as associações. O tempo médio sentado foi de $5,5 \pm 3,22$ horas/dia. A proporção de idosos no maior tercís do tempo sentado foi 43,8%. O maior tercís do tempo sentado foi positivamente associado (análises ajustadas) aos idosos mais velhos (RP 1,02; 95%IC: 1,01-1,04), ao sexo masculino (RP 1,23; 95%IC: 1,04-1,45), aos que viviam acompanhados (RP1,38; 95%IC:1,02-1,86), aos que trabalharam na agricultura ao longo da vida (RP1,24; 95%IC: 1,04-1,48) e aos que não estavam trabalhando (RP1,21; 95%IC:1,02-1,44). A prevalência de idosos no maior tercís do tempo sentado foi menor nos idosos analfabetos (RP 0,70; 95%IC=0,55-0,89), nos idosos que nunca fumaram (RP 0,60; 95%IC: 0,46-0,78) e naqueles com baixo peso (RP 0,49; 95%IC: 0,30-0,79) (associação inversa). Os resultados sugerem que as variáveis sociodemográficas e relacionadas ao estilo de vida foram associadas ao maior tercís do tempo sentado.

PALAVRAS-CHAVE

Envelhecimento; Idoso; Estilo de vida sedentário; Epidemiologia; Estudos transversais.

INTRODUCTION

Sedentary behavior (too much sitting time as opposed to too little exercise)¹ is characterized by activities that require little movement, such as lying down/ reclining posture or sitting². This behavior is increasingly common in the modern society^{3,4}, probably due to the increased use of computers, television, transport services, and the automation of household tasks⁵. While physical inactivity is a known risk factor for mortality⁵, the lengthy time spent sitting or engaged in sedentary behavior has only recently started to be investigated², especially in regard to the older adult population.

Regardless of the methodology used to evaluate outcome (self-assessment or accelerometry), studies assessing sedentary behavior / time spent sitting have shown that this is risky behavior that can result in several adverse health effects such as obesity, diabetes, metabolic syndrome^{6,7}, heart disease, all-cause mortality⁵, and changes in functional limitations in older individuals⁶. The studies conducted in developed countries involved urban population⁶⁻⁸ and suggest an age-related positive association with this behavior^{8,9}.

In Brazil, there are few studies (search conducted in Medline, Scopus and Scielo at 2013) addressing sedentary behavior/ time spent sitting among older adults¹⁰, including those who live in rural communities. The daily routines in countryside have characteristics that are different from large urban centers. Within the occupational setting, small towns and rural communities have greater proportions of population in occupations which require smaller volumes of sitting and exposure to technology at work^{1,11}. The occupational activities are numerous, demand much physical effort, begin at infancy or adolescence and are maintained throughout most of their lifespan¹¹. Countryside communities have reduced access to health care services (transportation difficulties, limited supply and diversity of healthcare workers)¹²⁻¹³, reduced schooling and lower average income¹¹. Furthermore, the populations of small towns / rural communities have and their own beliefs, values, principles and conduct¹¹ that affect lifestyle and health behavior and health¹².

A population-based perspective from different countries on the prevalence and sedentary behavior determinants is important to scientific progress². The environmental, social and cultural factors differ between countries¹⁻² and between urban and rural environments¹³, as well as the influence of these factors in sedentary behavior may differ²⁻¹³. It is necessary to understand the factors associated with this behavior in older adults from small towns and/or rural communities. The purpose of this study was to investigate the prevalence and associated factors with daily sitting time among older adults in a rural community in southern Brazil.

METHODS

This cross-sectional study reports data from an epidemiological, household-based population survey ('Saúde-AC'). The survey was conducted in the county of Antônio Carlos (Santa Catarina state) in southern Brazil (2010-2011). Detailed descriptions of the study setting and sampling procedures have been described previously¹⁴. In short, this county is the largest producer of vegetables in the state of Santa Catarina and most of the inhabitants

(~70.0%) live on small farms. The entire population has primary health care available through a primary care unit and three teams (doctors, nurses, nursing assistants and community health workers) working in the Family Health Strategy program (FHS). Each FHS team covers a specific area of the county¹⁵.

The study population consisted of all people aged ≥ 60 years enrolled in the FHS (n=917) in the county (2010). For those aged 60-79 years, the estimated sample (stratified by the three areas of the FHS) consisted of 343 older adults, considering an error margin of five percentage points, prevalence with an unknown outcome of 50%, test power of 80% and sample loss of 15%. It was decided to interview all the subject aged 80 years or above (n = 134). The stratified sample was not proportional, and sample weights have been used in the analysis of data. The criteria for sample loss included: the subject was not found after three visits on alternate days, absence of suitable informants when needed, and inability to access the residence due to the poor conditions of rural roads.

The form used was based on the same questionnaire (http://www.fsp.usp.br/sabe/Artigos/Questionario_2000.pdf) adopted by the *SABE* survey (Health, Well-being and Aging) conducted in Latin America and the Caribbean¹⁵, except for the assessment of the sitting time. This questionnaire was modeled after questionnaires used in other studies and surveys¹⁶.

Information and anthropometric measurements was obtained by a single interview held by trained interviewers at the residence of the participant (2010-2011). In the event the participant presented cognitive impairment or any health problems that compromised his/her ability to answer the questionnaire, the assistance of an auxiliary informant was required (proxy respondent).

The Human Beings Research Ethical Committee of the Universidade Federal de Santa Catarina (Case No 189/09) approved the research. The participants were provided information about the study and signed an informed consent for participation.

Dependent variable

Daily sitting time was assessed on the basis of Domain 5 of the *International Physical Activity Questionnaire* (IPAQ)¹⁷. This domain included time spent sitting or lying down at different places (rest period after lunch, time spent doing crafts in a sitting position, watching television and/or listening to the radio, reading, having meals at home, in a social group, in the church, etc.). The time spent during transport by car, bus, etc., was not considered as part of the sedentary time. The subjects were encouraged to report daily activities and time spent on each them. The time spent on sitting or lying activities were registered and summed. This variable was recorded in minutes, and the final result was obtained from: time spent sitting (min/week) = minutes in a sitting position on a week day * 5 workdays + minutes sitting on a weekend day * 2. To check the mean time, the value obtained was divided by seven, the number of days in a week. The sitting data (hours/day) were divided into two groups based on tertiles of sitting time: (< 6 hours/day, and highest tertile: ≥ 6 hours/day). Those older adult who were bedridden or non-ambulatory were not included in the analysis.

Explanatory variables

- *Sociodemographic*: sex, age, schooling (literate; illiterate), living arrangements (living alone; accompanied), occupation throughout life (agriculture; other), currently working (yes - working full-time, working part-time, and retired but still working or volunteering; no - on-leave or unemployed, retired and not working, including homemakers).
- *Life style*: smoking (smoker, former smoker, never smoked), alcohol consumption (0 or 1 day/week, 2 or more days/week).
- *Health conditions*: Number of morbidities (0-2, 3 or more), falls in the last year (yes, no), cognitive status (normal, altered)¹⁸. Body mass index [BMI = body mass (kg)/height (m²)] assessed nutritional status, according to the cutoff points adopted by the Brazilian System of Surveillance for Food and Nutrition (Portuguese acronym, SISVAN)¹⁹: BMI < 22.0 kg/m², underweight and BMI > 27.0 kg/m², overweight.

Statistical Analyses

Data analysis used means, standard deviations, and proportions. The association between explanatory variables and highest tertile of daily sitting time was tested by the Poisson Regression (crude and adjusted) and results were expressed as prevalence ratios. The adjusted analysis followed the order of a hierarchical model to determine the outcome: Level 1 – sex, age, schooling, living arrangements; Level 2 – occupation throughout life, currently working; Level 3 – smoking, alcohol consumption; Level 4 – nutritional status; Level 5 – number of morbidities, falls over the last year, and cognitive status. All the variables were considered for inclusion in the adjusted analysis regardless of the P-value in crude analysis. Variables with $p < 0.20$ remained at the same level and followed to the upper level using the backward variable selection procedure. Analyses were weighted for the effect of study design (post-stratification weight). The applied significance level was 5% ($p \leq 0.05$) and the confidence interval was 95%. The database, tabulation and data analyses were performed using the statistical software SPSS®, version 16.0.

RESULTS

The age of the 477 participants ranged from 60 to 100 years (74.2 ± 8.4 years). Just over half the sample were female, and the majority of the participants lived with others. In regard to lifestyle-related variables, the majority of the subjects consumed alcohol at most once a week, never smoked, were overweight, reported to have up to two morbidities and had not suffered falls in the last year (Table 1).

The proportion of older adults within the highest tertile of daily sitting time was 43.8%. The mean daily sitting time was 5.5 ± 3.2 hours/day.

Adjusted analysis (table 2) showed that men (PR=1.23; 95% CI =1.04 to 1.45), those who lived with other people (PR=1.38; 95% CI =1.02 to 1.86), older adults who had worked in agriculture throughout their lives (PR=1.24; 95% CI =1.04 to 1.48), and those who were no longer working (PR=1.21; 95% CI =1.02 to 1.44) were more likely to present highest daily sitting time (positive association). Furthermore, of the highest sitting time tended to in-

crease (positive association) with advancing age (PR=1.02; 95% CI =1.01 to 1.04). Older adults who were underweight (PR=0.49; 95% CI=0.30 to 0.79), illiterates (PR=0.70; 95% CI=0.55 to 0.89) and those who never smoked (PR=0.60; 95% CI =0.46 to 0.78) presented lower daily sitting time (negative association).

TABLE 1 - Characteristics of the study population.(Antônio Carlos, Santa Catarina state, Brazil; 2010-2011)

Variables	Response rate (%)	n	%*
Sex	100		
Female		270	56.8
Male		207	43.2
Schooling	100		
Literate		394	82.5
Illiterate		83	17.5
Living arrangements	100		
Living alone		65	13.6
Accompanied		412	86.4
Occupation throughout life	99		
Agriculture		331	70.1
Other		141	29.9
Currently working	98.3		
Yes		179	40.7
No		290	59.3
Smoking	100		
Smoker		34	7.8
Former smoker		110	22.6
Never smoked		333	69.7
Alcohol consumption	99.8		
0 or 1 day/week		427	89.2
2 or more days/week		49	10.8
Nutritional status	97.8		
Underweight		47	8.2
Normal weight		186	38.8
Overweight		233	53.0
Number of morbidities	100		
0-2		318	66.8
3 or more		159	33.2
Falls in the last year	99.8		
No		350	75.4
Yes		126	24.6
Cognitive status	97.9		
Normal		412	90.3
Altered		55	9.7

*weighted data

TABLE 2 – Prevalence, crude and adjusted analyzes* of sedentary behavior according explanatory variables.(Antônio Carlos, Santa Catarina state,Brazil; 2010-2011)

Level	Variables	Crude analyze			Adjusted analyze ³	
		%	PR ¹ (CI95%) ²	p	PR (CI95%)	p
1	Sex			0.28		0.01
	Female	42.5	1		1	
	Male	45.6	1.08 (0.93-1.26)		1.23 (1.04-1.45)	
1	Age ⁴	-	1.00 (1.00-1.01)	0.29	1.02 (1.01-1.04)	<0.001
1	Schooling			0.03		0.04
	Literate	45.6	1		1	
	Illiterate	35.1	0.77 (0.62-0.97)		0.70 (0.55-0.89)	
1	Living arrangements			0.32		0.04
	Living alone	13.3	1		1	
	Accompanied	86.7	1.13 (0.89-1.43)		1.38 (1.02-1.86)	
2	Occupation throughout life			0.03		0.02
	Other	38.4	1		1	
	Agriculture	46.5	1.21 (1.02-1.43)		1.24 (1.04-1.48)	
2	Currently working			0.13		0.03
	Yes	40.1	1		1	
	No	45.3	1.13 (0.96-1.32)		1.21 (1.02-1.44)	
3	Smoking			<0.001		<0.001
	Smoker	58.5	1		1	
	Former smoker	53.7	0.91 (0.72-1.15)		0.97 (0.77-1.24)	
	Never smoked	38.9	0.65 (0.52-0.82)		0.60 (0.46-0.78)	
3	Alcohol consumption			0.09		0.79
	2 or more days/week	51	1		1	
	0 or 1 day/week	42.9	0.83 (0.68-1.03)		1.04 (0.80-1.35)	
4	Nutritional status			0.40		0.01
	Normal weight	43.8	1		1	
	Underweight	25.4	0.60 (0.39-0.92)		0.49 (0.30-0.79)	
	Overweight	45.6	1.03 (0.88- 1.20)		1.02 (0.86-1.19)	
5	Number of morbidities			0.62		0.79
	0-2	43.1	1		1	
	3 or more	45.1	1.04 (0.89-1.22)		0.98 (0.82-1.16)	
5	Falls in the last year			0.42		0.60
	No	44.5	1		1	
	yes	41.6	0.93 (0.78-1.11)		0.95 (0.79-1.14)	
5	Cognitive status			0.38		0.28
	Normal	44.6	1		1	
	Altered	36.2	0.84 (0.61-1.15)		0.47-1.24)	

*weighted data; ¹PR, Prevalence ratio; ²CI95%, Confidence interval 95%; ³Ajusted for the variables in the same level and the superior value of the Wald test <0,20; ⁴Continuous variable.

DISCUSSION

The main finding of this study was that being older, being male, living with other people, having worked in agriculture, and not working, were each positively associated with highest tertile of daily sitting time. The illiterate older adults, subjects who had never smoked, and those who were underweight spent less time sitting (inverse association). The proportion of older adults within the highest tertile of daily sitting time was 43.8%.

In study involving Canadians aged 65 and above⁴ the prevalence of higher daily sitting time (4 hours or more/day) was 51.3%. Data from the *National Health and Nutrition Examination Survey* (NHANES 2003-2004) showed that the prevalence of individuals (70-85 years) with higher daily sitting time (about ~9 hours/day) was 67.8% and 66.3% in men and women, respectively⁹. In the *Women's Health Initiative (WHI)* study, the proportion (~50%) of women aged 60-79 years who spent > 6 hours/day (second quartile) in a sitting position was higher in comparison to this study³. The estimated prevalence of higher sitting time in older adults differs among the studies, probably due to the methodology for assessing the outcome, sampling procedure, cutoff point used to characterize such behavior, age of participants, and rural / urban context. Different of the present investigation, the Canadian⁴ and American⁹ studies analyzed data from non-institutionalized population, without differentiating regions (urban/rural, small town/ largest cities), and WHI study³ investigated women from 40 clinical centers in the United States. The comparison of prevalence estimates should be viewed with caution.

Some studies have verified the daily sitting time through self-reports^{3,20,21} and encountered different mean values. In the investigation conducted with South Asians and Europeans (mean age 59 years)²¹, as well as the study carried out with Azorean (mean age 38.7 years)²⁰, the average sitting time were similar to the present study. The mean daily sitting time in the study of Seguin et al.³ (American postmenopausal women) was higher than in the present study, both at the initial assessment (8.6 hours/day) and after three years of follow-up (8 hours/day).

Likewise, studies that used an accelerometer in the evaluation of sedentary behavior found results that differed from those in the present research. Studies found a mean daily sitting time of 12.7 (\pm 1.9) hours/day and 9.6 (\pm 1.7) hours/day in British²² and Portuguese²³ older adults, respectively. These differences can be related to the method of investigation of outcome, since these studies have adopted direct measures of sitting time as well as cultural and physical context. It is recommended to reduce sitting time⁷ as well as intersperse it with non-sedentary activities². However, the daily time spent in a sitting position or lying, sufficient to affect the health of the older adults is still unknown.

The adjusted analyses identified that being male were positively associated with highest tertile of daily sitting time. This finding is consistent with previous research involving the older adults, regardless of how the outcome was assessed^{6,8,9}. This may be due to that fact that women spend more time in daily self-care practices and typically provide some care for their husbands, but not the other way around. Furthermore, it is a cultural habit in Brazil that women are responsible for cleaning and tidying the house, as well as preparing the meals²⁴, which may help to spend less time sitting than men.

The positive association between highest tertile of daily sitting time / sedentary behavior and increasing age has been verified in previous studies^{1,8,9,25}. The increased time spent in a sitting position with advancing age might be related to greater leisure time after retirement^{9,25} and the characteristics of biological aging that affect bodily functions. However, in the present study, after adjustment for current work status, age is still associated with higher sitting time.

The results identified a positive association between those who are currently not working and higher daily sitting time. This result is consistent with

findings reported previously²⁴. However, it is important to note that the previous study²⁴ involved subjects aged 25-91 years (mean age 48.1 years) and the outcome was assessed by means of self-report on time spent watching television (leisure time), and in the urban context. Non-working older adults can be more likely to have time available as well as younger unemployed adults.

The results showed an inverse association between illiteracy and highest tertile of daily sitting time. Illiteracy is extremely high among Brazilian older adults, is more prevalent in rural context¹¹ and is associated with poor socioeconomic status and health. Literacy can contribute to the independence of older adults while influencing self-care practices; furthermore, it enables greater access to health-related information¹². It is possible that illiterate individuals are still working, and, given poor financial conditions, they need to do household chores²⁶, thus avoiding prolonged sitting.

The results of this study have shown that higher daily sitting time was more frequent (positive association) among older adults who lived together. Differing from our results, other studies' subjects who lived alone were seen to spend more time sitting^{3,25}. These differences may be related to cultural or rural/urban aspects, age of respondents, and evaluation of leisure or daily sitting time. In the Australian study²⁵ the age of respondents ranged from 25 to 91 years, and leisure time was analyzed. Postmenopausal women (50-79 years) participated in the study of Seguin et al.³, that verified the total sedentary time. In the present study, 12.4% of the older adults lived together with some relative¹². It is important to note that during data collection, it was verified that even those who lived alone had their houses located near (same ground) their family or other relative. This close proximity facilitates support to the subject in ordinary daily tasks (cooking, sweeping the yard, cleaning the house, etc.). Most of the sitting time among those who live together may reflect an overzealous family, which may lead the subject to reduce some daily activities, even though he/she often has the ability to perform them, resulting in increasing dependence²⁴. This situation may not be common in urban centers and older people who live alone can be present more disability³ and thus spend more time sitting.

The positive association between work in agriculture throughout life and higher daily sitting time may be justified by the fact that this is an exhausting physical activity that involves a high level of manual labor and intense effort using muscles and joints. This type of activity can result in chronic musculoskeletal pain, comorbidities, reduced joint motion²⁶, and decline of muscle strength and physical function even after the period of work²⁷. These changes can interfere in the way of doing other daily tasks²⁶ and thereby lead to increased time sitting.

The lower prevalence (inverse association) of higher daily sitting time among those who never smoked observed in this study is consistent with that found in a prospective research.³ Baseline data from a study by Seguin et al.³ showed that women (50 to 79 years) who had never smoked were likely to report the least sitting time. These results are also in line with data from a study carried out in 15 European Union countries (n=15,239), wherein the prevalence of sedentary lifestyle was higher in smokers and former smokers²⁸. Smoking is considered a risk factor for developing respiratory diseases characterized by symptoms such as dyspnea and fatigue, limiting airflow²⁹,

and leading to higher functional disabilities and consequently greater time in sedentary activities or more time sitting.

The inverse association between underweight and higher daily sitting time is consistent with others investigations^{3,30}. However, the age of participants as well as the BMI cut-off points for determining underweight were different among studies. The prospective study of Seguin et al.³ analyzed women (50 to 79 years) and the BMI cut-off points was $<18,5\text{kg/m}^2$. Hagströmer et al.³⁰ used a BMI of $<25\text{kg/m}^2$ to verify underweight in subjects from 18 to 75 years. Regardless of the method used to examine the outcome and age group, other studies have revealed an association between higher sitting time and overweight^{18,31}.

This study has several strong points. This is the first population-based household study in Brazil that investigated the daily sitting time and associated factors in older adults living in a rural community. Other strengths of this study are the selection of the sample, the high response rate, the training of researchers and the standardization of data collection, which reduces the probability of systematic errors, increases the internal validity of the study and ensures the extrapolation of results for the older adult population in the county. The results may add a novel approach to the discussion about daily sitting time in the older adult population, since previous studies on this topic were mainly based on developed countries and urban populations.

The study also has limitations. The cross-sectional design does not allow for establishing the cause and effect relationship. Nevertheless, the observed associations are supported by the literature. Daily sitting time was evaluated using a questionnaire, and this method may result in underestimation or overestimation of the answers, especially when responded to by someone who takes care of the person. Yet, the method used to verify daily sitting time is part of validated questionnaire and provides information on the full scope of this behavior, but not on specific domains⁸. It is noteworthy that the interviewers were trained so as to help the participant/caretaker to remember information related to the questionnaire, as well as the activities carried out in sitting position during the weekdays and weekends separately. The extrapolation of results should be made cautiously, since this study involves older adults from Antônio Carlos, a rural community in southern Brazil (Santa Catarina state). Brazil is a country with socioeconomic, cultural and lifestyle disparities among the regions.

In conclusion, when compared with others studies, the prevalence of highest tertile of daily sitting time is low among the older adults from Antônio Carlos. The comparison of prevalence estimates should be viewed with caution. In addition to the methodological differences in the outcome identification, the studies used different sampling procedures. Furthermore, the present study was conducted in a rural community, and the rural / urban divergences in social, cultural and environmental characteristics¹³ can reflect the results. According our results, the mean daily sitting time was 5.5 (± 3.2) hours/day. However, it has not been established the sitting time considered healthy for this age group. The socio-demographic and lifestyle-related variables are associated with higher daily sitting time. The observed results are indicative of the need for further studies involving older adults from different populations (rural and urban), as well as longitudinal investigations intended to identify the factors that led to these results. It is worth highlighting that the results of this study were submitted to the local health

department of the county, FHS teams (doctors, nurses and health workers) and the older adults. We carried out training of health professionals and health promotion activities and healthy lifestyle.

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