

ASSOCIATION BETWEEN SITTING TIME AND MAJOR DISEASES IN BRAZILIAN OCTOGENARIANS

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ABSTRACT: The aim of this study was to associate sitting time with major diseases affecting octogenarians. This observational cross-sectional study involved 351 octogenarians, being 323 women and 28 men, with a mean age of 84.1 (SD = 3.9). Sociodemographic data, health conditions and responses to Section 5 of the International Physical Activity Questionnaire (IPAQ) were entered into a diagnostic program in order to determine the weekly time spent sitting down. Descriptive (single frequency, percentage, mean, and standard deviation) and inferential statistics (Mann-Whitney U test and binary logistic regression) were used. The data were examined at a 5% significance level. The most frequent diseases in the octogenarians were high blood pressure (60.1%), heart diseases (26.5%), diabetes (21.9%), dyslipidemia (21.7%), osteoporosis (18.5%), and osteoarthritis (14.5%). The longer they spent sitting down, the greater the risk of developing diabetes (OR = 4.5, 95% CI 2.5 to 8.2) and dyslipidemia (OR = 2.9, 95% CI 1.6 to 5.0). A sitting time of more than 1,710 minutes per week can predict the occurrence of diabetes ($p = 0.002$), while sitting for more than 1,380 minutes per week can predict the occurrence of dyslipidemia ($p = 0.002$). Sitting time was found to be a risk factor for the occurrence of diabetes and dyslipidemia in the studied octogenarians. Chronic diseases were associated with sedentary behavior.

KEYWORDS: Age of 80 and over. Aging. Sedentary lifestyle.

ASSOCIAÇÃO ENTRE TEMPO SENTADO E AS PRINCIPAIS DOENÇAS EM OCTOGENÁRIOS BRASILEIROS

RESUMO: O objetivo deste estudo foi associar o tempo sentado com as principais doenças que afetam as pessoas octogenárias. Este estudo observacional e transversal foi composto de 351 pessoas octogenárias, 323 mulheres e 28 homens. Associou-se dados sociodemográficos, condições de saúde e o domínio 5 do Questionário Internacional de Atividade Física (IPAQ) para determinar o tempo despendido por semana na posição sentada. Foram utilizadas estatísticas descritivas (frequência única, percentagens, média e desvio padrão) e estatística inferencial (teste de Mann-Whitney e regressão logística binária). Os dados foram examinados em um nível de significância de 5%. As doenças mais frequentes nas pessoas octogenárias foram hipertensão arterial (60,1%), doenças do coração (26,5%), diabetes (21,9%), dislipidemia (21,7%), osteoporose (18,5%) e osteoartrite (14,5%). Quanto maior o tempo gasto na posição sentada, maior as chances de desenvolver diabetes (OR = 4,5, IC 95% 2,5-8,2) e dislipidemia (OR = 2,9, IC 95% 1,6-5,0). O tempo sentado maior que 1710 minutos por semana pode prever a ocorrência de diabetes ($p = 0,002$), sentar-se por mais de 1380 minutos por semana pode prever a ocorrência de dislipidemia ($p = 0,002$). Verificou-se que o tempo sentado é um fator de risco para a ocorrência de diabetes e dislipidemia nos octogenários. As doenças crônicas mostraram associação com o comportamento sedentário.

PALAVRAS-CHAVE: Envelhecimento. Estilo de vida sedentário. Idoso de 80 anos ou mais.

Introduction

In 1980, Brazil had approximately 600,000 people aged 80 or older. After 30 years, this figure rose to 1.6 million in 2010 and is projected to increase to 9 million in 2020 and to 14 million in 2040. In the literature, this population is called the “octogenarians” (IBGE, 2010).

The population of octogenarians is characterized by a high prevalence of chronic diseases, disabilities, and neurodegenerative diseases (IBGE, 2010). The most common cardiovascular and neurodegenerative diseases (MARENGONI et al., 2008) in this age group are hypertension (ACOSTA et al., 2010), chronic renal failure (POTTELBERGH et al., 2012; CORESH et al., 2007), and Alzheimer’s disease (AL-

ZHEIMER ASSOCIATION, 2011). In addition to their association with older age, these diseases are associated with sedentary behavior (sitting while watching television and using computer and games, sitting in a vehicle, sitting at work, and activities characterized by low energy expenditure - from 1.0 to 1.5 METS) (OWEN et al., 2010; OWEN; BAUMAN; BROWN, 2009; HAMILTON et al., 2008) and with lower physical activity levels, as well as their metabolic consequences that contribute to the emergence of these diseases (TREMBLAY et al., 2010). Other factors that can increase sitting time are the technological advances that operationalized the execution of domestic and work tasks and the changes in transportation, communication and entertainment technologies that are associated with significantly lower levels of

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physical activity (OWEN et al., 2010; OWEN; BAUMAN; BROWN, 2009; HAMILTON et al., 2008; TREMBLAY et al., 2010; MENEGUCI et al., 2015; FORD; CASPERSEN, 2012).

The analysis of sitting time in older adults has been the focus of many studies (SEGUIN et al., 2012; NILSSON; WAHLIN-LARSSON; KADI, 2017; REID et al., 2017). Sitting time is considered a marker of sedentary behavior and is an important public health problem. Studies have shown that excessive sitting time can compromise health because it is a risk factor for obesity (TREMBLAY et al., 2010), type 2 diabetes (TREMBLAY et al., 2010), cardiovascular disease (TREMBLAY et al., 2010), and breast and colon cancer (OWEN et al., 2010). In addition, prolonged sitting can cause premature death (OWEN et al., 2010).

Further research on this topic is encouraged to increase our understanding of the health implications of sitting time (OWEN et al., 2010; HAMILTON et al., 2008; MENEGUCI et al., 2015), particularly for specific populations that remain sitting for long periods of time, such as octogenarians. Given these findings, one may ask whether the time octogenarians spend sitting is related to the occurrence of chronic diseases because this behavior implies a passive and inactive lifestyle. Therefore, the aim of this study was to associate

sitting time with major diseases that affect octogenarians.

Methodological procedures

Study design and Ethical Procedures

This observational cross-sectional study met the ethical principles of Resolution 466/2012 of the National Health Council. The study was approved by the Ethics Committee of the University of the State of Santa Catarina (UDESC) in accordance with law 146/2012 for studies involving humans (reference number 149/2010).

Population and Sample

The study population involved octogenarians registered in one of the social groups of the five health regions (center, east, south, north, and continent) in the municipality of Florianópolis, Santa Catarina (SC). Sample inclusion criteria were being oldest-old of both sexes, regular enrollment in the social groups during the time of data collection, and voluntary agreement to participate in the study. We excluded subjects who were identified by the group coordinator as having cognitive impairment. The final sample consisted of 351 octogenarians, 323 women (92.0%) and 28 men (8.0%) (Picture 1).

Picture 1: Study sample. Florianópolis/SC, Brazil. 2011.

Region	Number of social groups	Number of octogenarians registered	Number of octogenarians interviewed	
			Male	Female
Center	31	168	6	96
East	9	45	5	32
South	18	86	8	60
North	16	75	5	51
Continent	28	119	4	84
Total	102	493	28	323

Instruments and Data Collection

First, we contacted the municipality of Florianópolis to gain access to the telephone numbers and addresses of the registered social groups and to learn the name and telephone number of the coordinators of each group. The social groups registered in the municipality of Florianópolis offer manual activities (knitting, crocheting, and sewing), entertainment (bingo, cards, and dominoes), education (lectures and courses), tours, and snacks. The groups usually meet once a week (PREFEITURA MUNICIPAL DE FLORIANÓPOLIS, 2009).

The next step was to identify the number of octogenarians registered in these groups to invite them to participate in the study and to clarify the objectives of the study. The octogenarians who agreed to participate signed two copies of a consent form. First, using a questionnaire, we identified sociodemographic factors (sex, age, education, and marital status) and the presence of the following diseases: hypertension, diabetes, dyslipidemia, depression, osteoporosis, arthritis, arthrosis, back pain, bronchitis, emphysema, asthma, gastritis, constipation, urinary incontinence, cancer, hearing impairment, eye disease, heart disease, and sequelae of stroke. Next, we applied the International Physical Activity Questionnaire (IPAQ), version 8, for a long and normal week, adapted for seniors (MAZO; BENEDETTI, 2010).

The IPAQ allows the estimation of weekly physical activities of moderate or vigorous intensity related to work, transportation, housework and leisure, performed for at least 10 continuous minutes during a normal week. In addition to the level of physical activity, this instrument can be used to measure sedentary behavior through the domain related to sitting time during a normal week. Only this domain was used in this study. The questions are explained in the study of Benedetti et al. (2007). Both questionnaires were applied by interview.

Data Treatment

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS), version 17.0. For descriptive statistics, simple frequency, percentage, mean and standard deviation were calculated. The distribution of the data was verified by the Kolmogorov-Smirnov test. The Mann-Whitney U test and binary logistic regression were used for inferential analysis between the independent variables and the presence or absence of diseases with a frequency greater than 10.0%. The explanatory variables were age (in years), sex (female/male), and daily time spent sitting (more than 5 hours/less than 5 hours). We adopted a level of significance of 5%.

Receiver operating characteristic (ROC) curves

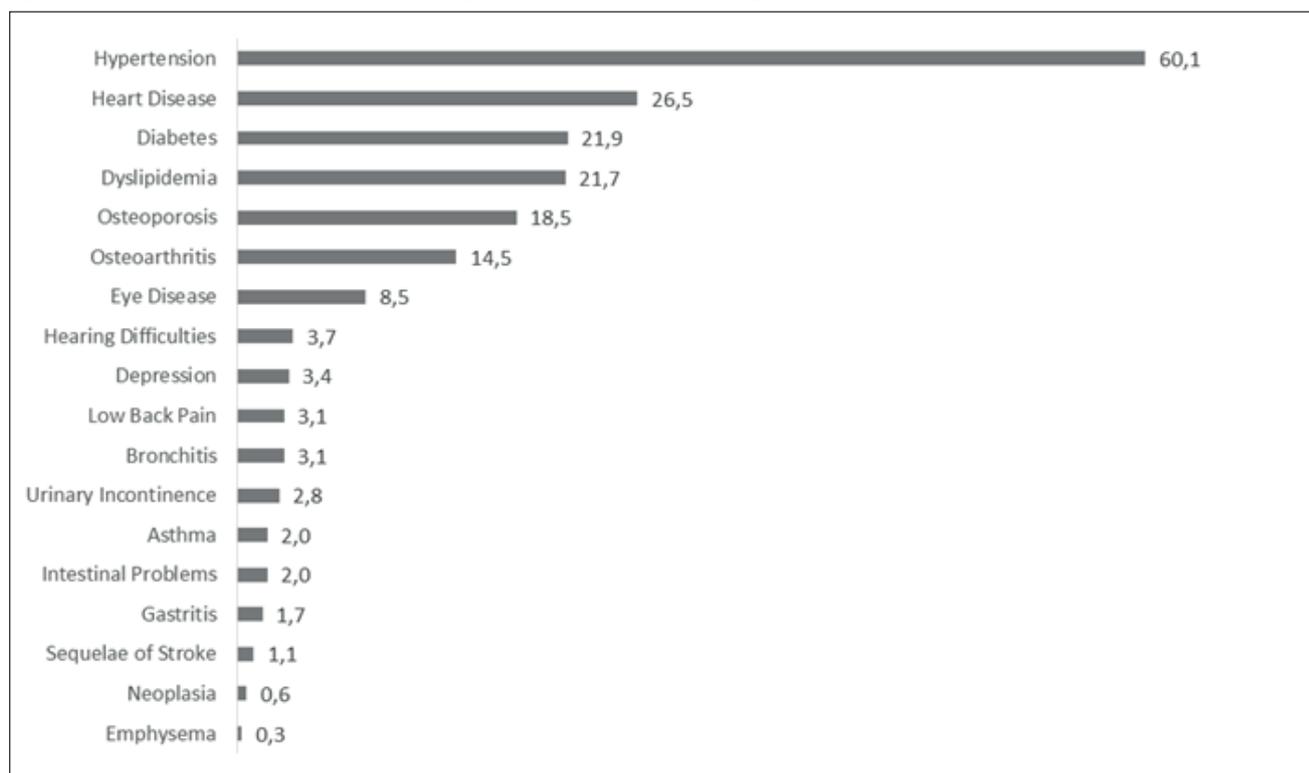
were used to identify the sensitivity and specificity of the best cut-point for sitting time that can be used to discriminate the development of diabetes and dyslipidemia.

Results

With respect to sociodemographic data, 77.2% of the participants were widowed and 55.8% had incomplete elementary education.

Figure 1 shows the frequencies of the diseases investigated in the sample of octogenarians.

Figure 1: Relative frequency (%) of self-reported diseases in the octogenarians studied (n = 351).



Hypertension was the main disease reported by the octogenarians (60.1%). There was also a high incidence of heart disease (26.5%), diabetes (21.9%), dyslipidemia (21.7%), osteoporosis (18.5%), and arthritis (14.5%).

The time spent sitting was compared to the presence of these diseases (Table 1). It can be observed that the average

sitting time was significantly higher ($p < 0.001$) among octogenarians with diabetes (2695.3 ± 1082.5 minutes per week) and dyslipidemia (2578.4 ± 915.3 minutes per week). This difference was also observed among older adults with osteoarthritis ($p = 0.011$).

Table 1: Comparison of the time spent sitting (minutes per week) according to the presence of some prevalent diseases in the octogenarians studied (n = 351).

Disease	Presence Mean (\pm SD)	Absence Mean (\pm SD)	U	p
Hypertension	2069.7 (1141.1)	2190.0 (1030.2)	13586.0	0.229
Heart disease	2118.1 (1081.6)	2207.6 (1063.1)	11341.5	0.465
Diabetes	1985.8 (1023.1)	2695.3 (1082.5)	6492.0	< 0.001**
Dyslipidemia	2020.8 (1087.2)	2578.4 (915.3)	6957.0	< 0.001**
Osteoporosis	2114.0 (1066.4)	2264.1 (1116.9)	8357.5	0.218
Osteoarthritis	2082.1 (1071.2)	2492.7 (1045.9)	5939.0	0.011*

SD = standard deviation; U = Mann-Whitney U test; p = significance level.

Legend: * $p \leq 0.05$, ** $p < 0.001$.

Considering the results of Table 1, we performed binary logistic regression analysis in which the presence/absence of diabetes, dyslipidemia and osteoarthritis were the dependent variables. Analyses were performed separately

with the following explanatory variables: sex (female/male), age (years), and time spent sitting per week (more than 5 hours/less than 5 hours).

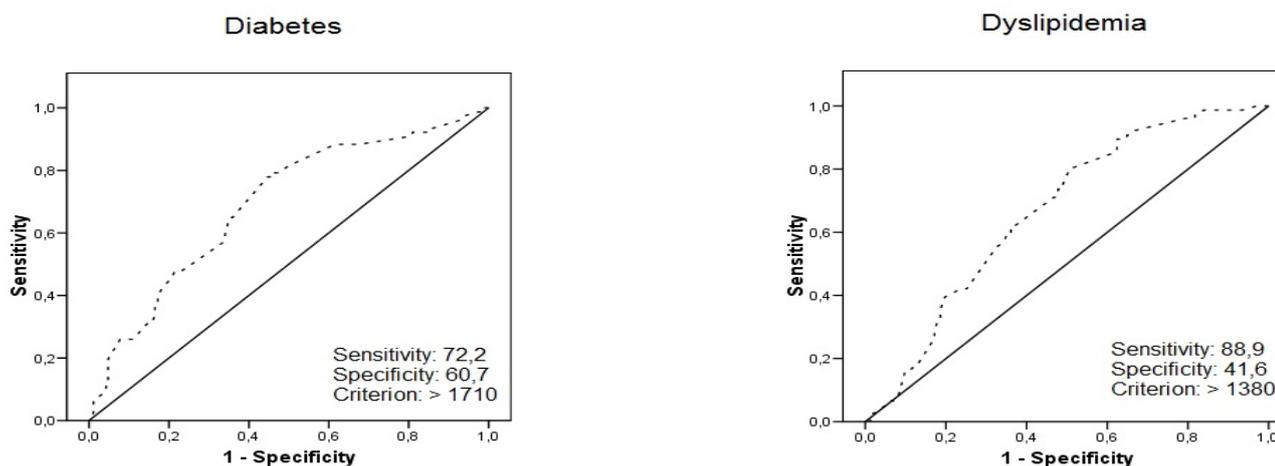
Table 2: Logistic regression analysis of the explanatory variables sex, age and time spent sitting on the occurrence of disease in the octogenarians studied (n = 351).

Disease	OR Unadjusted (95% CI)	OR Adjusted (95% CI)
Diabetes		
Age	0.996 (0.933 – 1.063)	0.974 (0.910 – 1.042)
Sex		
Female	1.000	1.000
Male	0.758 (0.278 – 2.064)	0.848 (0.298 – 2.415)
Time spent sitting		
Less than 5 hours per day	1.000	1.000
More than 5 hours per day	4.397 (2.440 – 7.924)	4.575 (2.525 – 8.290)*
Dyslipidemia		
Age	0.969 (0.905 – 1.037)	0.952 (0.887 – 1.022)
Sex		
Female	1.000	1.000
Male	0.411 (0.121 – 1.400)	0.443 (0.127 – 1.544)
Time spent sitting		
Less than 5 hours per day	1.000	1.000
More than 5 hours per day	2.819 (1.627 – 4.883)	2.901 (1.659 – 5.073)*
Osteoarthritis		
Age	0.971 (0.900 – 1.055)	0.968 (0.892 – 1.051)
Sex		
Female	1.000	1.000
Male	0.202 (0.027 – 1.522)	0.209 (0.028 – 1.582)
Time spent sitting		
Less than 5 hours per day	1.000	1.000
More than 5 hours per day	1.529 (0.839 – 2.804)	1.568 (0.848 – 2.900)

OR = odds ratio; 95% CI = 95% confidence interval.

Table 2 shows that the longer the time spent sitting, the greater the risk of diabetes and dyslipidemia. The risk of diabetes increases by approximately 4.5 times in octogenarians who spend more than 5 hours per day sitting. The risk of dyslipidemia increases by 2.9 times in octogenarians who spend more than 5 hours per day sitting. Age and sex did not increase the risk of these diseases in the octogenarians studied.

To evaluate the accuracy of time spent sitting per week in predicting diabetes and dyslipidemia, ROC curves were constructed (Figure 2). The areas under the curves for diabetes and dyslipidemia were 66.5% ($p = 0.002$) and 68.2% ($p = 0.002$), respectively. A weekly sitting time longer than 1,710 minutes can predict the occurrence of diabetes, while a weekly sitting time longer than 1,380 minutes can predict dyslipidemia.

Figure 2: ROC curves to identify the accuracy of time spent sitting in predicting the occurrence of diabetes and dyslipidemia in the octogenarians studied (n = 351).

Discussion

Without their work routine, octogenarians remain at home for long periods of time and spend many hours watching television, an activity of low caloric expenditure. Thus, they have a greater tendency to decrease the weekly time devoted to physical activities (BINOTTO; BORGATTO; FARIAS, 2010).

Grontved and Hu (2011) and Gardiner et al. (2011) noted that "watching TV" is the most prevalent sedentary behavior. Benedetti, Petroski and Gonçalves (2004) studied older adults living in Florianópolis and observed that those who were less active spent more time sitting watching television, listening to the radio and receiving visitors than those who were more active. Longitudinal studies (HAMILTON et al., 2008; VAN DER PLOEG et al., 2012; MATTHEWS et al., 2012) involving individuals over 45 years of age found that the time spent sitting is a risk factor for all-cause mortality and a higher prevalence of cognitive problems and depressive symptoms, regardless of physical activity level.

According to the study by Veerman et al. (2011), spending an average of six hours per day watching television reduces an individual's life expectancy by up to 4.8 years. Benedetti, Mazo and Borges (2012) found that the prevalence of disease is higher among older adults participating in social groups compared to non-elderly participants in these groups.

The combination of physical inactivity and biopsychosocial losses resulting from the aging process is significantly associated with biochemical markers of obesity and health problems (BINOTTO; BORGATTO; FARIAS, 2010; COSME; OKUMA; MOCHIZUKI, 2008). Therefore, the presence of disease is very common in this age group, with only 15% of octogenarians being without disease. This rate is lower than the 22.6% of people aged 60 or older who do not have disease (IBGE, 2010).

Among the diseases analyzed in this study, it is noteworthy that the presence of diabetes was associated with the time spent sitting. A meta-analysis by Grontved and Hu (2011) showed that watching television for two hours or more increases the risk of developing diabetes by 20% (OR = 1.2), as well as the risk of cardiovascular disease (OR = 1.1).

It is known that participation in moderate to vigorous physical activities plays a role in preventing cardiovascular disease and type II diabetes. However, according to Hamilton et al. (2008) and Thorp et al. (2010), epidemiological evidence suggests that sitting time has detrimental effects on the cardiovascular system as well as on metabolism. The cross-sectional study "Perfil de saúde da população idosa do município de Uberaba/MG" conducted on 3,265 older adults revealed that subjects who spend 330 minutes/day or more sitting are more likely to develop diabetes than subjects who spend ≤ 137.1 minutes/day sitting, even after adjustment for sex, age range, household income, perception of health status, body mass index, waist circumference, consumption of alcoholic beverages, and smoking (SILVA et al., 2015).

In the study of Gardiner et al. (2011) involving 1,958 older Australians, older women that remained sitting for more than 6.5 hours per day were more likely to develop metabolic syndrome (OR: 1.6), abdominal obesity (OR: 1.8), and high triglycerides (OR: 1.7). Among men, those who remained sitting for more than seven hours per day were more

likely to have metabolic syndrome (OR: 1:6), high triglycerides (OR: 1.6), and low HDL cholesterol levels (OR: 1.8).

Within this context, the findings of Santos et al. (2010) should be mentioned which showed that adult men with greater sedentary behavior had a higher body mass index, thereby increasing obesity-related health risks. Although few studies have specifically mentioned the presence of dyslipidemia, it is a metabolic disorder that is strongly associated with the other diseases mentioned.

Analysis of the association of sitting time with major diseases that affect octogenarians participating in social groups is important for public health since the results could help establish strategies designed to reduce this behavior in these groups, as well as household interventions aimed at increasing physical activity levels in this population. These proposals should encourage specifically brief interruptions to prolonged sitting since interrupting sitting time can increase total energy expenditure, contributing to lower body fat gain, increased muscle contractions and lower risk of developing metabolic problems (MENEGUCI et al., 2015). Furthermore, these octogenarians should be encouraged to perform the largest number possible of transportation, leisure-time and domestic activities in the standing position, as Hamilton et al. (2008) explain that the simple fact of standing during activities cannot be considered a sedentary behavior since it requires isometric contraction of the muscles to oppose gravity.

The use of a self-reported questionnaire to measure sitting time may have overestimated the results in the sample of octogenarians. In addition, we did not use data on physical activity level as a control variable. Another important factor is the participation of the octogenarians in community groups whose activities may have contributed to increase sitting time in this population. Furthermore, the absence of cutoff points for sedentary behavior in this population impairs comparison with the results of the present study. Another limitation was that the sample was not obtained by probability sampling, which may compromise extrapolation of the data.

However, a strength of the study was the large size of the sample considering the particular age of the population. The size of the sample was sufficient for the statistical analysis proposed and is representative of the octogenarians participating in community groups in Florianópolis/SC.

Conclusion

The present results show that sitting time is a risk factor for the occurrence of diabetes and dyslipidemia in the octogenarians studied.

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