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Correlates of excessive daytime sleepiness in community-dwelling older adults: an exploratory study

Fatores relacionados à sonolência diurna excessiva em idosos da comunidade: um estudo exploratório

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ABSTRACT: Excessive daytime sleepiness (EDS) imposes a wide range of adverse health-related outcomes in older people, such as disability, which impair everyday activities and may increase the risk of fall. Few studies have explored EDS in Brazilian older people living in the community who are typically cared in primary health services. This study aims to investigate the prevalence of EDS and its sociodemographic, physical and mental health correlates among community-dwelling older adults. This is an exploratory, population-based study derived from Frailty in Brazilian Older Adults (FIBRA) study including adults aged 65 years and older. Participants with a score ≥ 11 points on the Epworth Sleepiness Scale were considered as having excessive daytime sleepiness. A structured, multidimensional questionnaire was used to investigate sociodemographic, physical and mental health, and self-rated health variables. The sample was composed of 776 older adults, of whom 21% (n = 162) presented excessive daytime sleepiness. Multivariate regression analysis revealed that EDS is associated with obesity (OR = 1.50; 95%CI 1.02 – 2.20), urinary incontinence (OR = 1.53; 95%CI 1.01 – 2.31), poor self-rated health (OR = 1.54; 95%CI 1.06 – 2.24), and depression symptoms (OR = 1.49; 95%CI 1.00 – 2.20). Our results suggest that healthcare professionals should identify older adults with EDS and implement intervention strategies to minimize the negative impact of the co-occurrence of this condition with obesity, depression and urinary incontinence over health and quality of life.

Keywords: Sleep disorders. Health of the elderly. Health status. Epworth scale. Cross-sectional studies. Population-based study.

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RESUMO: A Sonolência Diurna Excessiva (SDE) está relacionada a vários efeitos adversos na saúde de pessoas idosas, como a incapacidade funcional, que compromete as atividades do cotidiano e aumenta o risco de quedas. Poucos estudos têm explorado a SDE em idosos brasileiros que vivem na comunidade, que são tipicamente cuidados em serviços de atenção primária em saúde. Este estudo tem como objetivo investigar a prevalência da SDE e sua correlação com dados sociodemográficos, físicos e sobre a saúde mental de idosos que vivem na comunidade. Este é um estudo exploratório de base populacional, derivado da Rede de Estudos de Fragilidade de Idosos Brasileiros (FIBRA) com idosos com de 65 anos ou mais. Participantes com um escore ≥ 11 pontos na Escala de Sonolência de Epworth foram considerados como tendo SDE. Um questionário estruturado, multidimensional foi usado para investigar as variáveis sociodemográficas, físicas, saúde mental, e qualidade de vida. A amostra foi composta por 776 idosos, dos quais 21% (n = 162) apresentavam SDE. A análise de regressão múltipla revelou que a SDE está associada à obesidade (OR = 1.50; IC95% 1.02 – 2.20), incontinência urinária (OR = 1.53; IC95% 1.01 – 2.31), má qualidade de vida (OR = 1.54; IC95% 1.06 – 2.24) e sintomas depressivos (OR = 1.49; IC95% 1.00 – 2.20). Nossos resultados sugerem que profissionais da saúde devem identificar os idosos com SDE e implementar intervenções para minimizar o impacto negativo da coocorrência dessas condições com obesidade, depressão e incontinência urinária sobre a saúde e qualidade de vida.

Palavras-chave: Transtornos do sono. Saúde do idoso. Nível de saúde. Escala de Epworth. Estudos transversais. Estudo populacional.

INTRODUCTION

Sleep disorders are common among the older adult population[1]. More than half of the people aged 65 and over presented at least one chronic sleep disorder[1,2] causing insufficient sleep[3] that may lead to excessive daytime sleepiness[1].

Excessive daytime sleepiness (EDS) is commonly a secondary symptom of sleep disorders and it is characterized by the difficult in maintaining awake in the wake period[4]. The severity of sleepiness is based on frequency and degree of impairment on daily activities[3]. The prevalence of excessive daytime sleepiness varies between 11 and 25% for the general population[5,6] and may reach up to 30%[3] in the older adult population. In Brazil, studies with older adults have shown a prevalence varying between 13 and 18%[7,8],

EDS is a symptom typically related to sleep disturbances, such as obstructive sleep apnea, narcolepsy and idiopathic hypersomnia[9]. In addition, it is also related to poor health status[10], low physical activity levels, disability in daily activities[10] and an increased number of depression symptoms[11]. Among older people, napping for long periods during the day is related to an increased risk of falling[12].

Some methods used for objective assessment of excessive sleepiness are polysomnography and multiple sleep latency. These assessments are time-consuming, require high financial investment and specifics sleep laboratories, preventing their use in epidemiological studies. Subjective measurements include some scales as Stanford Sleepiness[13] and Karolinska Sleepiness[14] that assesses EDS in the moment of application. To determine subjectively as EDS may influence daily activities, the most appropriate scale is Epworth[15] that assess the probability of sleep in activities.

A substantial rise in the proportion of older adults in the Brazilian population is predicted to come within the next decades, reaching 30% of the population in 2050[16], demanding integrated, systemic, and comprehensive interventions to minimize the negative impact on health and quality of life imposed by the cumulative and multifactorial nature of comorbidities and clinical conditions in later life. The aim of this study is to estimate the prevalence and to investigate sociodemographic, physical and mental health correlates of EDS in community-dwelling older adults.

METHOD

This is a cross-sectional exploratory, population-based study derived from a Frailty in Brazilian Older Adults (FIBRA) network study. The sample for this study was composed of older adults aged 65 or older, living in the municipalities of Barueri, São Paulo (Human Development Index – HDI of 0.786) and Cuiabá, Mato Grosso (HDI: 0.785), both in Brazil. The study was carried out from March 2009 to April 2010.

Participants' exclusion criteria were

1. cognitive impairment according the Mini–Mental State Examination, adjusted for educational level[17];
2. inability to walk temporarily or permanently, even with a walking device;
3. localized strength loss and aphasia caused by stroke;
4. Parkinson's disease (either severe or unstable state);
5. severe hearing or visual impairment that impairs communication; or
6. terminal illness.

The evaluation was carried out by trained researchers in two phases, the first consisting of a semi-structured interview carried out at home in sessions that lasted from 40 to 120 minutes. The second phase consisted of a data-gathering session using physical-functioning tests that lasted from 20 to 30 minutes that was carried out in public schools, community centers, and health centers close to the older adults' homes.

The Epworth Sleepiness Scale[18] was used to determine the degree of excessive sleepiness. It is a scale composed of eight items, in which the subject marks the possibility of napping in routine situations, such as watching television, lying down to rest, and while being a passenger in a vehicle. The scoring for each item varies from 0 (no chance of napping) to 3 (great probability of napping). A score of ≥ 11 points indicates excessive daytime sleepiness.

The eight-item scale has a reliability coefficient (Cronbach's α) of 0.83. The scale has been validated for older American women and has an adequate internal consistency ($\alpha = 0.76$)[19], In Brazil it has been validated for adults[18] and its feasibility was tested in institutionalized older people[20], demonstrating that is possible use this instrument. Despite the limitations, this is a widely used scale for EDS assessment in older population[8,9,11,21,22].

Sociodemographic variables analyzed were: gender, age (grouped 65 – 69, 70 – 74, 75 – 79 and 80 years and older), education level (0 – 1, 1 – 4, 5 – 8, 9 years or more), and gross monthly family income (0 – 1, 1 – 3, 3 – 5, 5 minimum wages and above).

Self-rated health was assessed by asking the participant to evaluate the general status of his or her health (very good, good, regular, bad, or very bad).

The presence of diseases diagnosed by a physician in the last year was identified by self-report[13]. The following diseases were considered: hypertension, arthritis, heart diseases, diabetes mellitus, stroke, depression, osteoporosis, bronchitis/emphysema. Participants were considered obese if they had a Body Mass Index (BMI) $\geq 30\ kg/m^2$. The health conditions evaluated were urinary incontinence, sleeping problems, and single falls (only one fall) and recurrent falls (two or more falls) in the last 12 months. The presence of depression symptoms was assessed by the 15-item Geriatric Depression Scale[23]. Participants were also questioned about the regular use of medications. The number of medications was counted and the presence of polypharmacy (use of four or more regular medications in the last three months[14]) was ascertained.

Frailty was established accordingly to the phenotype proposed by Fried et al.[24] Older adults who presented three or more of the following criteria were rated as frail:

1. unintentional weight loss within the last year (over 4,5 kg or 5% of body weight);
2. exhaustion or fatigue, based on answers to the Center for Epidemiologic Studies Depression Scale (CES-D);
3. low handgrip strength measured with a dynamometer (SAEHANW – SH 5001), indicated by values below the first quintile of the sample, adjusted by gender and BMI;
4. low gait speed, indicated by values above the 80th percentile of time needed to walk a distance of 4.6 meters, adjusted by height and gender;
5. low energy expenditure in kilocalories per week, which was indicated by values below the first quintile of the sample, adjusted by gender, measured by a summarized version of the Minnesota Leisure Time Activities Questionnaire (Q-MLTPA)[25].

The Pontifícia Universidade Católica (PUCSP) and the Ethics in Research Committee of the Hospital das Clínicas de Ribeirão Preto of the Universidade de São Paulo (HCRP-USP) Ethics Committees approved this study. All participants gave written informed consent before data collection began.

A descriptive analysis of the variables was made using simple frequency. The comparison between groups with or without excessive daytime sleepiness was carried out using the χ^2 or Fisher's exact test for categorical variables, while the *t-test* was used for quantitative variables. The level of significance was maintained at $\alpha < 0.05$. Afterwards, we performed a multivariate logistic regression analysis. Items with $p < 0.05$ were excluded from the analysis one by one, following the sequence of the value of p. In case an item was eliminated, that variable was considered as a confusion factor if there was a change in the rest of the parameter that exceeded 20% (coefficient β). Fatigue was conceived of as a confounding variable during analysis, and was eliminated in the final model. The odds ratios with respective (95%CI) and the values of p were reported. We evaluated the adjustment of the multiple-regression model by the Hosmer-Lemeshow

goodness-of-fit test. Discrimination was quantified using area under the curve (ROC curve) with 95%CI. The statistics package used for data analysis was SPSS 19.0 for Windows.

RESULTS

Were enrolled 1,088 older people in the homes belonging to assorted census regions and 776 of these were included in this study, 391 of them from the city of Cuiabá, Mato Grosso, Brazil, and 385 from the city of Barueri, São Paulo, Brazil. The study flowchart is presented in Figure 1.

The average age of the participants in this study was 71.9 years (± 5.9), 496 of them (64%) being female. Of all the participants, 333 (43%) reported trouble sleeping and 162 (21%) presented excessive daytime sleepiness. Considering only those older people who reported sleeping problems, 70 (21%) had excessive daytime sleepiness.

Sociodemographic characteristics, physical and mental health and self-rated health characteristics among older adults with and without EDS are presented in Table 1 and Table 2, respectively. The final multivariate logistic regression model pointed out that excessive daytime sleepiness is associated with obesity, urinary incontinence, depressive symptoms, and poor self-rated health (Table 3).

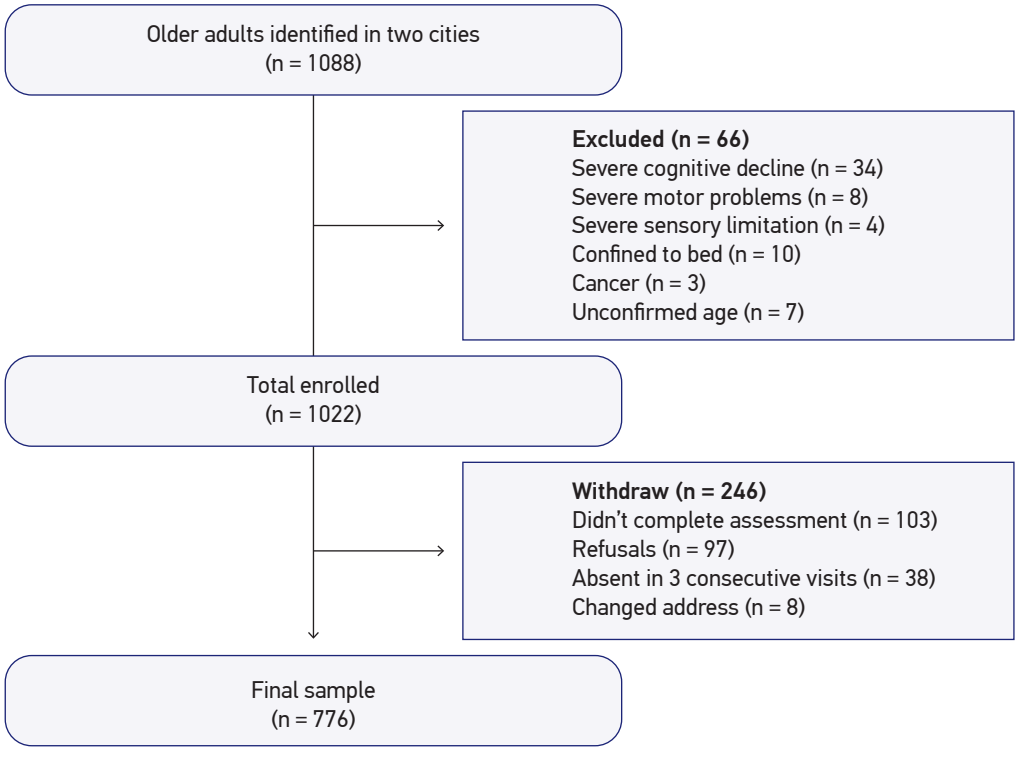

Figure 1. Flowchart of the study participants.

DISCUSSION

About 20% of the older adults presented excessive daytime sleepiness, which was not associated with sociodemographic factors (gender, age, schooling, and income), but with clinical factors (urinary incontinence, obesity and depression symptoms) and also with poor self-rated health among community-dwelling older adults.

The prevalence of excessive daytime sleepiness observed in our study is greater when compared to studies carried out with similar populations[9,26,27], including a study conducted in Brazil, in which the prevalence was 13%[7]. According to Hara et al.[7], a possible explanation for this disagreement observed in the literature may rely on the distinct definitions used for sleepiness. In addition, different scales with different cut-off points have been

Table 1. Sociodemographics characteristics for the total population, the no sleepiness and the excessive daytime sleepiness groups.

Variable	Total population	No excessive daytime sleepiness	Excessive daytime sleepiness	p value
	n (%)	n (%)	n (%)	
Female sex	497 (64.0)	395 (64.3)	102 (63.0)	0.783
Age				
65 – 69 years	332 (42.0)	267 (43.5)	65 (40.1)	0.638
70 – 74 years	219 (28.2)	167 (27.2)	52 (32.1)	
75 – 79 years	131 (16.9)	106 (17.3)	25 (15.4)	
≥ 80 years	94 (12.1)	74 (12.1)	20 (12.3)	
Educational level				
0 – 1 year	212 (27.3)	166 (27)	46 (28.4)	0.842
1 – 4 years	365 (47.0)	287 (46.7)	78 (48.1)	
5 – 8 years	113 (14.6)	93 (15.1)	20 (12.3)	
≥ 9 years	86 (11.1)	68 (11.1)	18 (11.1)	
Monthly family income*				
0 – 1 minimum wage	411 (54.7)	329 (54.7)	82 (54.7)	0.137
1 – 3 minimum wages	232 (39.9)	192 (31.9)	40 (26.7)	
3 – 5 minimum wages	58 (7.7)	40 (6.7)	18 (12.0)	
5 minimum wages and above	50 (6.7)	40 (6.7)	10 (6.7)	

**missing values*: monthly family income (n = 25).

Table 2. Clinical data for the total population, the no sleepiness and the excessive daytime sleepiness groups.

Variable	Total population	No excessive daytime sleepiness	Excessive daytime sleepiness	p value
	n (%)	n (%)	n (%)	
Self-rated health				
Very good or good	383 (49.4)	321 (52.3)	62 (38.3)	0.004
Regular	337 (43.4)	254 (41.4)	83 (51.2)	
Poor or very poor	56 (7.2)	39 (6.4)	17 (10.5)	
Diseases and health conditions*				
Hypertension	521 (67.1)	407 (66.3)	114 (70.4)	0.348
Arthritis	239 (30.8)	185 (30.1)	54 (33.3)	0.445
Urinary incontinence	157 (20.3)	110 (17.9)	47 (29.2)	0.003
Sleeping problems	333 (43.0)	263 (43.0)	70 (43.2)	1.000
Diabetes mellitus	192 (24.7)	148 (25.1)	44 (27.2)	0.415
Heart disease	147 (18.9)	115 (18.7)	32 (19.8)	0.822
Obesity	206 (26.5)	151 (24.6)	55 (34)	0.021
Depression symptoms	194 (25.0)	139 (22.6)	55 (34)	0.004
Body mass index				
Up to 18.5	18 (2.3)	15 (2.4)	3 (1.9)	0.052
18.5 – 25.0	242 (31.2)	203 (33,1)	39 (24.1)	
25.0 – 30.0	310 (39.9)	245 (39.9)	65 (10.1)	
30.0 and over	206 (26.5)	151(24.6)	55 (34)	
Polypharmacy				
0 – 1 medications	261 (33.6)	198 (32.2)	63 (38.9)	0.096
2 – 3 medications	295 (38)	245 (39.9)	50 (30.9)	
4 medications and over	220 (28.4)	171 (27.9)	49 (30.2)	
Number of diseases				
0 – 1 diseases	278 (35.9)	228 (37.2)	50 (18)	0.235
2 – 3 diseases	343 (44.3)	270 (44.0)	73 (45.3)	
4 diseases and over	153 (19.8)	115 (18.8)	38 (23.6)	
Frailty phenotype*				
Weight loss	111 (14.6)	521(86.1)	130 (82.8)	0.310
Fatigue	163 (21.0)	117 (19.1)	46 (28.4)	0.012
Handgrip Strength	157 (20.2)	124 (20.2)	33 (20.4)	1.000
March	156 (20.1)	123 (20.1)	33 (20.4)	0.913
Physical Activity	158 (20.4)	126 (20.5)	32 (19.8)	0.913
Frail classification				
No frail	322 (42.3)	261 (43.2)	61 (38.9)	0.523
Pre frail	365 (48.0)	287 (47.5)	78 (49.7)	
Frail	74 (9.7)	56 (9.3)	18 (11.5)	
Single falls*	300 (38.7)	234 (38.1)	162 (40.7)	0.586
Recurrent falls*	123 (15.9)	91 (14.8)	32 (20.0)	0.115

**missing values*: Urinary Incontinence (n = 1); Diseases and Health Conditions (n = 2); Weight loss (n = 14); March (n = 1); Frail Classified (n = 15); Recurrent falls (n = 2).

Table 3. Final model of multivariate regression analysis for excessive daytime sleepiness in community-dwelling older adults, a Frailty in Brazilian Older Adults study (n = 776).

Variable	β coefficient	Odds ratio	95%CI	p-value
Obesity	0.408	1.50	1.02 – 2.20	0.036
Urinary incontinence	0.425	1.53	1.01 – 2.31	0.044
Poor self-rated health	0.434	1.54	1.06 – 2.24	0.023
Depressive symptoms	0.399	1.49	1.00 – 2.20	0.047

Hosmer and Lemeshow Test = 0.580; Area under the curve = 0.622, 95%CI 0.57 – 0.67.

used to identify EDS, which may also justify, at least in part the observed difference in prevalence. For example, similarly to our study, Souza et al.[8] used the Epworth Sleepiness Scale and observed a prevalence of EDS close to the proportion observed in our study (18%). However, in the study of Hara et al.[7], which used a different questionnaire, the prevalence was smaller (13%), possibly because they questioned about the presence of sleepiness occurring three or more times per week.

The assessment of EDS in population-based studies commonly uses questionnaires for measurement, as Epworth Scale. In Brazil, this scale was validated only for adults[18] but is widely use in older population[8,9]. The use of the gold standard of sleep disorders, such as polysomnography and multiple sleep latency, are time-consuming, expensive and needing of specific laboratories, making it impossible to use in studies realized in the community.

We did not find an association with gender. The results concerning gender are contradictory; whereas some authors indicate that sleepiness is related to the male gender[8,9,26], others say that it prevails within the female gender[28,29]. Specifically within the Brazilian population, a greater prevalence of EDS was observed among women[7]. The authors suggested that it may be explained by the presence of some clinical conditions, such as depression, insomnia and restless legs syndrome among women[7] Hormonal and body composition differences among men and women could also play a role in the rate of EDS[28].

In this study participants were not submitted to medical assessment, so the presence of disease was identified by self-report. To minimize this influence in the results, the interviewer enquired if the participant had some medical diagnosis in the last year and about recent exams, for example.

Studies carried out with the older adult population show a substantial relationship between depressive symptoms and excessive daytime sleepiness[11], as does our study, in which older adults with depression symptoms had a higher probability of presenting EDS when compared with older adults without depressive symptoms. Hayley et al.[22] discussed that sleepiness is commonly associated with anxiety in older women, suggesting that one must be careful when evaluating the mental state of patients who present daytime sleepiness.

Evidences have associated EDS with the use of medications that act in the Central Nervous System influencing in regulation of neurotransmitters responsible for modulation of sleep and wakefulness[12,30], In this study was not observed any relation between polypharmacy and EDS, maybe due the fact that we did not ask about the use of psychotropic, for example, just for the number of medications in use.

Urinary incontinence was found to be related to sleep problems[27]. In our study, participants who presented urinary incontinence also presented 1.5 times greater probability of presenting EDS when compared with those who didn't report having urinary incontinence. Teo et al.[27] pointed out that female older adults presenting urinary urgency and excessive sleepiness were almost two times more prone to fall when compared with other females who did not present that clinical condition. We have not observed in our study any association between excessive daytime sleepiness and falling or recurrent falling. It is possible that we didn't observe any association with falls due to the fact that we did not discriminate incontinence type, once the urinary urgency requires older people to take more risky behaviors, especially during night time to get up and go to the bathroom[31] In addition, nocturia may cause difficult to initiating and maintaining sleep at night[31], with a negative impact on motor and cognitive performance, mainly because of reduced awareness levels during the day[32]. Sleepiness may hamper the ability to process and integrate information (visual, tactile, auditory, and proprioceptive), compromising reaction time and balance anticipatory adjustments, resulting in stumbles and falls[27].

Another health condition that has been shown to be associated with excessive sleepiness is obesity. In this study 34% of EDS population were obese. Evidences shows that obese older people has fragmented sleep at night and an increased nap during the day[33]. The causes of EDS in obese people is still uncertain[4,34] but some studies frequent suggests that EDS is a secondary symptom of other sleep disorders, as Obstrutive Sleep Apnea (OSA), snoring and narcolepsy[4]. It is important to note that in this research was assessed the EDS.

The association between self-rated health and EDS in our study is noteworthy, since self-rated health is considered a significant and powerful indication of overall health[19] and is related to increased mortality and poorer quality of life among older adults[15].

The results of this study allow healthcare professionals, especially those who are primary health care practitioners, to identify older adult profiles with higher odds of presenting excessive daytime sleepiness. The early identification of EDS and its correlates may help to prevent the well-known negative consequences of this condition for community-dwelling older adults' health and quality of life[20,35,36].

This research is cross-sectional, which not allows the identification of casual factors. However, it must be noted that this is a population-based study, with a good external validity. Future longitudinal studies could investigate risk factors, particularly the effects of excessive daytime sleepiness and sleep disorders on functional performance restraint in Brazilian older adults.

CONCLUSION

Excessive daytime sleepiness in community-dwelling older adults is related with depression, obesity, urinary incontinence, and poor perceived health. Our results suggest that healthcare professionals should identify older adults with EDS and implement intervention strategies to minimize the negative impact of the co-occurrence of this condition with obesity, depression and urinary incontinence on health and quality of life.

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