ORIGINAL ARTICLE

Prevalence of excessive daytime sleepiness and associated factors in women aged 35-49 years from the "Pindamonhangaba Health Project" (PROSAPIN)

Elaine Cristina Alves Pereira[1], Ana Carolina Basso Schmitt[2], Maria Regina Alves Cardoso[3], Wendry Maria Paixão Pereira[4], Geraldo Lorenzi-Filho[5], Juan Enrique Blumel[6], José Mendes Aldrighi[3]

[1] MSc in Public Health; Professor at Fundação Universitária Vida Cristã (FUNVIC), São Paulo, SP, Brazil
[2] PhD in Public Health; Professor of the Department of Physical Therapy, Speech Therapy and Occupational Therapy, Faculdade de Medicina, Universidade de São Paulo (FMUSP), São Paulo, SP, Brazil
[3] Associate Professors, Faculdade de Saúde Pública, Universidade de São Paulo (FSP/USP), São Paulo, SP, Brazil
[4] MSc; Professor, Universidade de Taubaté (UNITAU), Taubaté, SP, Brazil
[5] Director of the Sleep Laboratory, Instituto do Coração (INCOR), São Paulo, SP, Brazil
[6] PhD; Professor, Faculdade de Medicina, Universidade do Chile, Santiago, Chile

Summary

Objective: To estimate the prevalence of excessive daytime sleepiness (EDS) and to identify associated factors in women aged 35 to 49 years from the "Pindamonhangaba Health Project" (PROSAPIN). **Methods:** This was a cross-sectional observational study of 372 women aged 35 to 49 years, randomly selected from the Family Health Strategy (FHS) program of the city of Pindamonhangaba – SP, Brazil, where the "Pindamonhangaba Health Project" (PROSAPIN) is being developed. EDS was assessed through interviews using the Epworth Sleepiness Scale and the associated factors through questions that investigated socio-demographic characteristics, gynecological history, presence of comorbidities, lifestyle, sleep routine, and use of drugs capable of altering the state of alertness; anthropometric variables were also measured. The prevalence of EDS was estimated with a 95% confidence interval (95% CI) and the associated factors were identified through a multiple logistic regression model performed with the Stata software, release 10.0. **Results:** EDS prevalence was 18.5% (95% CI: 14.7-22.9) and the associated factors were: profession related to domestic services (OR = 2.2, 95% CI: 1.1-4.3), physical activity level above the mean of the study population (OR = 1.9, 95% CI: 1.1-3.4), and presence of features suggestive of anxiety (OR = 1.9, 95% CI: 1.1-3.4). **Conclusion:** The prevalence of EDS in women aged 35-49 years from PROSAPIN was high and associated with sociodemographic characteristics, presence of comorbidities, and lifestyle.

Keywords: Disorders of excessive sleepiness; women; public health.

Introduction

Excessive daytime sleepiness (EDS) is a frequent complaint in the population and can result from diseases such as obstructive sleep apnea syndrome (OSAS)[1,2]; depression; anxiety;use of drugs for heart disease, hypertension, diabetes, allergies, muscle contractures[3]; and habits such as alcoholism, sedentary lifestyle[4], and insufficient sleep[5,6].

It compromises quality of life due to the impairment it causes in work performance, interpersonal relations, and cognitive and neuropsychological functions[7], in addition to causing a higher risk of car accidents[5], and metabolic[8] and cardiovascular[9] diseases.

Its prevalence is higher in individuals aged between 20 and 49 years, that is, during the most productive phase in life[5,10-14]. It is known that high demands at work and the incessant quest for professional development are sources of physical exhaustion; this, associated with non-restorative sleep, either due to the small number of hours slept or the poor quality of sleep, result in EDS[15].

In females, excessive sleepiness is further aggravated by the accumulation of domestic responsibilities such as taking care of home and children[16]; apart from the fact that, after the age of 37, women suffer from hormonal fluctuations that lead to symptoms such as anxiety or depression, hot flashes, and night sweats that also interfere with sleep, making it lighter, intermittent, and shorter[17].

It is essential that health professionals know the triggers of this condition and develop primary care strategies to prevent its occurrence or to minimize its negative effects on quality of life. Thus, this study aimed to estimate the prevalence of EDS in women aged 35 to 49 years treated by the "Pindamonhangaba Health Project" (PROSAPIN), and to identify possible anthropometric, sociodemographic, clinical, and lifestyle-related factors that may be associated with its occurrence.

Methods

Population

This is a cross-sectional study conducted in the municipality of Pindamonhangaba, in the countryside of the state of São Paulo, with women aged 35 to 65 years enrolled in the Family Health Strategy (FHS). At the time of the study, the municipality had a primary health care network consisting of 18 family health teams covering 34% of the population (45,537 individuals)[18].

The reference population consisted of 7,212 women who were in the age group of interest and were registered in the FHS. Of these, 875 were randomly selected by systematic sampling with stratification by age and health unit. To calculate the sample size, the lowest prevalence of all variables studied in PROSAPIN were considered: 20% of metabolic syndrome[19], a maximum error of 3% in 95% of the possible samples, and possible losses.

Of the 875 women, 126 did not participate in the study for the following reasons: two had cognitive deficit, 121 refused to participate or had changed address, one was unable to stand during the anthropometric measurements, and two were hospitalized during the data collection period. Thus, 749 women (85.6%) participated in the study.

The present article corresponds to an arm of PROSAPIN that studies EDS only in women younger than 50 years, i.e. from 35 to 49 years, thus providing a sample of 372 individuals.

PROSAPIN was authorized by the Health Secretariat of Pindamonhangaba and approved by the Ethics Committee of the School of Public Health, Universidade de São Paulo (FSP/USP) under protocol No. 1324.

Dependent variable: excessive daytime sleepiness

For the investigation, the Epworth Sleepiness Scale was used, which quantifies the propensity of the individual to fall asleep in the following routine situations: sitting and reading; watching TV; sitting in a public place, without activity (waiting room, meeting, movie theater); as a train, car, or bus passenger, riding for an hour without stopping; laying to rest in the afternoon when circumstances permit; sitting and talking to someone; sitting quietly after lunch without alcohol ingestion; and in the car while stopped for a few minutes in heavy traffic. This scale attributes a value to each question that corresponds to the chance of falling asleep: 0 = no, 1 = small, 2 = moderate, and 3 = high chance. Together, they generate a maximum score of 24 and a minimum of 0, identifying sleepy individuals as those with scores greater than 10[20].

Independent variables

Anthropometric measurements were obtained (weight, height, and hip and abdomen circumferences) and interviews were conducted in order to obtain information on sleep (latency and number of hours slept), sociodemographic characteristics, gynecological history, and use of medications that can alter alertness. Furthermore, comorbidities and lifestyle were also assessed in the interview using validated instruments for: depression (Beck Depression Inventory)[21], anxiety (Beck Anxiety Inventory)[22], obesity (World Health Organization's Classification of Obesity)[23], obstructive sleep apnea (Berlin Questionnaire)[24], usual physical activity (Baecke Questionnaire)[25], and smoking and drinking (I National Survey on patterns of alcohol consumption and smoking in the Brazilian population)[26,27].

To ensure quality and prevent systematic errors, data collection was monitored daily and at the end of the study it was submitted to a re-check, by randomly selecting 10% the studied women for a re-interview by phone.

Data analysis

The prevalence of EDS was estimated with 95% CI. Bivariate analyses were performed to identify possible associations between EDS and independent variables. A multiple logistic regression model was designed, initially including all variables that were associated with EDS in the bivariate analyses, and later testing the remaining variables. All analyses were performed using the software Stata, release 10.0.

Results

372 women aged 35 to 49 years with a mean age of 41.5 ± 4.0 years were studied. The prevalence of EDS was 18.5% with 95% CI of 14.7% to 22.8%.

Table 1 shows the sociodemographic characteristics of the studied women, who were mostly married (81%), white (51%), Catholic (66%), and who attended school until the 8th grade (72%). 48% had no paid work. Among those who worked, 22% had occupations related to domestic services (housekeepers, maids, cooks, etc.), and 83% had a per capita income of up to one minimum wage.

Table 2 describes the clinical characteristics reported by participants, of whom 68% menstruated regularly, 29% had systemic arterial hypertension (SAH), 5% had diabetes mellitus (DM), 8% had heart diseases, 19% had polycystic ovary syndrome (PCOS), and 8% had hyperuricemia. The measurement of anthropometric variables identified 65% of women with body mass index (BMI) > 25.52, i.e., overweight or obese, 70% with waist circumference (WC) > 88 cm, and 84% with a waist/hip ratio (WHR) > 0.80.

Table 1 – Sociodemographic characteristics of 372 women aged 35 to 49 years, PROSAPIN, 2008

Variables	n*	%
Marital status		
Married	283	81
Separated/divorced	56	16
Widowed	10	3
Religion		
Catholic	244	66
Protestant and others	128	34
Level of schooling		
Up to 8th grade	260	72
9th grade or further	100	28
Occupation		
Does not work	176	48
Housework	81	22
Other types of work	105	28
Retired/pensioner	7	2
Income per capita (MW)		
Up to 1 MW	288	83
More than 1 MW	60	17

*The total number of women for each variable was not the same due to the lack of answers. PROSAPIN, The Pindamonhangaba Health Project; MW, minimum wages.

Table 2 – Clinical history of 372 women aged 35 to 49 years, PROSAPIN, 2008

Variables	n*	%
Menstrual regularity		
Yes	250	68
No	119	32
Hypertension		
Yes	108	29
No	262	71
Diabetes mellitus		
Yes	19	5
No	342	95
Obesity or overweight		
Yes	129	35
No	241	65
PCOS		
Yes	66	19
No	290	81
Hiperuricemia		
Yes	29	8
No	316	92
OSAS		
High risk	62	17
Low risk	301	83
Depression		
Yes	110	30
No	262	70
Anxiety		
Yes	187	50
No	185	50

*The total number of women for each variable was not the same due to the lack of answers. PCOS, polycystic ovary syndrome; OSAS, obstructive sleep apnea syndrome.

Table 2 also shows information on depression, anxiety, and sleep apnea. As the instruments used for the investigation of these diseases were validated questionnaires for screening features suggestive of the disease in epidemiological studies, and not to define diagnosis, it can be said that 30%, 50%, and 17% of the women had features suggestive of depression, anxiety, and obstructive sleep apnea (OSA), respectively.

Regarding lifestyle, a questionnaire that quantifies the level of usual physical activity, i.e., occupational energy expenditure in physical exercise or leisure activities and during locomotion, with the total physical activity being the sum of all these energy expenditures, was used for the assessment of physical activity. This instrument has no cutoff point, as it compares an individual only with other individuals belonging to the same population. Its analysis is based on through the mean value of energy expenditure in the population, indicating that some people are above or below the mean of this population. Thus, 55% of the women studied had a level of total physical activity up to the mean of the studied population.

Additionally regarding lifestyle, 24% were smokers, 25% drank alcohol, 37% reported the habit of sleeping fewer than six hours per night, and 27% reported using drugs that interfered with the state of alertness.

When the bivariate analyses were performed, associations between EDS and the level of occupational physical activity, leisure, and locomotion above the mean of that of the studied population (OR = 2.2, 95% CI: 1.3-3.7); professions related to domestic services (OR = 2.5, 95% CI: 1.3-4.8); presence of PCOS (OR = 1.9, 95% CI: 1.0-3.5); and fewer than six hours of sleep per night (OR = 1.8, 95% CI: 1.1-3.2) were identified.

The final multiple logistic regression model identified the following factors as independently associated with EDS in the study population: level of occupational physical activity, leisure and locomotion above the mean of that of the study population; professional services related to domestic services; and features suggestive of anxiety[28] (Table 3).

This model also included the participants' menstrual regularity, and menstrual irregularity was not associated with the occurrence of EDS (OR = 1.2, 95% CI: 0.7-2.1).

Discussion

Although no studies that investigated EDS exclusively in women aged 35-49 years were identified, the existing ones showed that part of their sample consisted of women in this age range[10,29-35].

In Brazil, only two population studies were found with a random sample that investigated exclusively EDS, with the inclusion of individuals of both genders older than 18 years. The first, conducted in the countryside of the state of Bahia, reported a prevalence of 21.5%[29].The second, conducted in the capital of the state of Mato Grosso do

Table 3 – Adjusted odds ratios (OR) with the respective 95% confidence intervals (95% CI) for clinical and epidemiological characteristics of women from PROSAPIN with EDS, 2007-2008

Characteristics	Adjusted OR*	95%CI
Total physical activity		
≤ mean	1	
> mean	1.96	1.11-3.46
Profession		
Does not work	1	
Housework	2.21	1.12-4.32
Others	1.29	0.65-2.54
Anxiety		
No	1	
Yes	1.94	1.09-3.44
Hours of sleep		
> 6 hours	1	
≤ 6 hours	1.65	0.94-2.91
Obstructive sleep apnea		
Low risk	1	
High risk	1.64	0.83-3.23

* Adjusted by the variables in the table and by menstrual regularity.

Sul, found a prevalence of 18.9%[10]. Both studies showed no prevalence stratified by gender and age, which makes it difficult to compare them with the present results.

The prevalence of EDS in other countries also shows variation. In Thailand, 19.5% of the population has excessive sleepiness symptoms[30]; in Norway, 17.7%[31]; in Latin America (Mexico, Chile, Venezuela, and Uruguay), 16.4%[32]; in Korea, 12.2%[33]; in Spain, 11.6%[34]; and in Japan, 2.5%[35]. Although all of these studies included individuals of both genders aged > 18 years, only two showed the prevalence of EDS separated by gender, but not by age. Thus, in Korea excessive sleepiness is present in 13.7% of women[31] and in Japan, in 2.2% of the women[35].

Some studies report that EDS is more prevalent among the elderly[36,2]. However, other studies demonstrate that the frequency of the condition is higher in individuals aged 20 to 49 years[5,10-14]. Corroborating these findings, this study found a high prevalence of EDS (18.5%) among women aged 35 to 49 years.

The present study showed three other high prevalence rates: depression (30%), anxiety (50%), and PCOS (19%). The first two rates corroborate the results of other Brazilian studies that investigated emotional disorders in women[37,38]. However, the prevalence of PCOS is high

when compared to the only study conducted in Brazil, in which the proportion of women with PCOS in Bahia was 8.5%[39].

The first hypothesis for the difference between the two studies refers to the type of instrument used for data collection. Fernandes[39] assessed the prevalence of PCOS using ultrasound equipment, while the present study's prevalence was assessed through a questionnaire, in which self-reporting of this disease included the woman in the group of affected individuals.

At first glance, the divergence suggests overestimation of the present study's PCOS prevalence. However, when comparing the prevalence of SAH reported by the present study's participants (29%) with the prevalence of hypertension measured by the anthropometry team (28%) the quality of the reported data is observed. Thus, a second hypothesis, that there actually is a difference between the prevalence of PCOS between the Northeast and Southeast regions, becomes more relevant. The similarity between the reported and measured data reinforces the validity of the present study, mainly related to the high prevalence of EDS in women aged 35-49 years.

EDS may derive from several factors, but the endocrine system appears to be of particular importance. Gracia et al.[17] found that in the presence of progressive hormonal fluctuations of early menopausal transition, from 37 years of age onward, significant changes occur in sleep architecture, caused by the insufficiency of progesterone in the premenstrual phase.

In fact, difficulty in falling asleep or recurrent nocturnal awakenings are common premenstrual symptoms, affecting 20% to 40% of women in the menopausal transition, which, by reducing the number of hours of sleep, allow the onset of EDS[40].

In the bivariate analysis, there was a clear association between EDS and sleeping fewer than six hours a night, a fact already well-documented in the young population, for which there was an increased prevalence of EDS from 15.6% in 1960 to 37.1% in 2001[41]. It seems that the main reason for this increase is professional, as the young individual, concerned about earning an income, starts working early and often has more than one job[15]. In the case of women, the situation becomes even more complex due to the accumulation of responsibilities for the care of children and home[16].

However, the association between sleeping fewer than six hours a night and the presence of EDS lost part of its statistical significance in the multivariate analysis. A possible explanation is that the interviewees were questioned regarding the number of hours slept during the night, without any questions about the habit of sleeping during the day. Considering that 47.7% of participants did not work outside the home, the habit of daytime sleep may have been a confounding factor, not fully controlled in the analysis.

Another significant risk factor for the development of EDS in the present study was the domestic nature of work (maids, housekeepers, cooks, washerwomen or cleaning aid) possibly due to the long working hours inherent to these activities, which include little or no rest intervals[42].

According to the physical activity questionnaire used (Baecke)[25], it was observed that participants who had a level of physical activity with intensity and frequency greater than the mean of the studied sample had a higher risk of developing EDS. Although some studies have reported that physical activity reduces or eliminates EDS, in a more refined analysis, all studies that reported reduction of EDS had the bias of including only physical activity programs, without considering usual physical activities originating from daily activities[4,36], which prevents comparison with the present results.

Therefore, it is believed that a level of physical activity above the average for a specific population may mean an activity overload, favoring an increase in EDS.

It was also observed that the presence of features suggestive of anxiety was another risk factor for EDS, a result that is similar to that obtained by Kravitz et al.[43], in which 35% of women in menopausal transition who had this emotional disorder had difficulty falling sleep.

Other possible factors responsible for EDS are the concerns of everyday life, such as little help from the spouse regarding household chores, lack of social strategies to ensure the education and care of children, and fear of not providing adequate care for children and of not dedicating appropriately to one's career[16].

Any type of worry may be a triggering agent of the process: difficulties in falling asleep, fewer hours of sleep, malaise, fatigue, and EDS on the following day.

Obesity and WC $\geq$ 88 cm are other risk factors for the development of EDS. However, the latter has been more involved in the onset of OSA syndrome, characterized by repeated pauses in breathing, lasting $\geq$ 10 seconds, followed by transiently waking or superficial sleep throughout the night, which results in sleep fragmentation or deprivation, of which the main clinical manifestation is EDS[1,2,44].

The study found no association between EDS, waist circumference, and OSA, possibly because the women classified as overweight or obese (BMI > 25), or with waist circumference $\geq$ 88 cm, had a homogenous distribution of fat in the hip and abdomen regions (gynecoid shape).

The results of this study reflect the profile of the studied population, as the Pindamonhangaba FHS treats most often the poorer population, with the vast majority being women with low educational level and income.

The professional activities related to domestic services may have been associated with EDS due to the fact that many participants were not employed during the study period (some lived on welfare provided by the federal government) and the low level of schooling may not have allowed other types of work rather than domestic ones. However, it is important to emphasize that professions like those require great physical effort, and consequently cause fatigue.

Finally, some information about the present study must be considered. First, as it is an epidemiological study, the focus was to screen for features suggestive of some diseases and not to perform diagnoses.

Second, as this is a transversal study, it does not allow for conclusions regarding causality. Another point to be taken into account that the data were obtained through interviews, thus important information may have been omitted. In spite of the use of validated tools, the multiple sleep latency test was not performed to confirm EDS.

CONCLUSION

The prevalence of EDS in women aged 35-49 years from PROSAPIN was high and among the main risk factors for its occurrence, a level of physical activity greater than the mean observed in the studied population a profession associated to housework and characteristics suggestive of anxiety must be emphasized; these results are relevant in terms of public health.

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