THE EFFECTIVENESS OF THE EPWORTH SLEEPINESS SCALE AS AN AUXILIARY RESOURCE IN THE DIAGNOSIS OF OBSTRUCTIVE SLEEP APNEA SYNDROME

A efetividade da escala de sonolência de Epworth como recurso auxiliar no diagnóstico da síndrome da apnéia obstrutiva do sono

La efectividad de la escala de somnolencia de Epworth como recurso auxiliar en el diagnóstico del síndrome de la apnea obstructiva del sueño

ABSTRACT

Objective: *To analyze the effectiveness of the Epworth Sleepiness Scale (ESS) as an auxiliary resource in the diagnosis of the Obstructive Sleep Apnea Syndrome (OSAS).* **Methods:** *Observational study, with a retrospective phase and a prospective one, comprising 475 patients who sought the Sleep Study Center in Fortaleza (Centro de Estudo do Sono de Fortaleza - CESF). Data was collected from medical records, which comprises ESS, amidst some questionnaires prepared by CESF professionals and answered by the patients. The study compared the results raised by the ESS to the polysomnography data. Data analysis was performed on SPSS, using Pearson chi-square test, considering as statistically significant p-value < 0.05.* **Results:** *The male, the group aged 50 to 60, and those with body mass index > 30 kg/m² were the most affected by OSAS, with 38.9%, 41% and 45.1%, respectively. A significant relationship was found between ESS score and OSAS (p = 0,001), showing that 25.9% (n = 123) of patients, who had values higher than 10 in the ESS, were diagnosed with OSAS.* **Conclusions:** *Data on this study shows that ESS fits as an auxiliary resource in the diagnosis of OSAS and it may be applied by any health professional while taking the clinical history. However, clinical signs are not sufficient to diagnose it, so that polysomnography is still required.*

Descriptors: *Evaluation; Obstructive Sleep Apnea; Polysomnography.*

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RESUMO

Objetivo: Analisar a efetividade da Escala de Sonolência de Epworth (ESE) como recurso auxiliar no diagnóstico da Síndrome da Apnéia Obstrutiva do Sono (SAOS). **Métodos:** Estudo observacional, sendo uma etapa retrospectiva e outra prospectiva com 475 pacientes que procuraram o Centro de Estudo do Sono de Fortaleza (CESF). Os dados foram coletados a partir de prontuários, que constam de questionários, incluindo a ESE, elaborados pelos profissionais do CESF e respondidos pelos pacientes. O estudo comparou os resultados obtidos na ESE com os dados da polissonografia. A análise dos dados foi realizada através do SPSS, utilizando o teste de Qui-quadrado de Pearson, considerando como estatisticamente significantes valores de p < 0,05. **Resultados:** O sexo masculino, na faixa etária de 50 a 60 anos e com índice de massa corpórea > 30 kg/m² foram os mais acometidos pela SAOS com respectivamente 38,9%, 41% e 45,1%. Foi evidenciada uma relação significativa entre a pontuação da ESE e a SAOS (p = 0,001), mostrando que 25,9% (n = 123) dos pacientes, que obtiveram valores maiores que 10 na ESE, estavam com diagnóstico de SAOS. **Conclusões:** Os dados desta pesquisa mostram que a ESE serve como recurso auxiliar para o diagnóstico da SAOS, podendo ser aplicada por qualquer profissional de saúde durante as anamneses clínicas. Porém, a clínica do paciente não é suficiente para diagnosticá-la, sendo necessário o exame de polissonografia.

Descritores: Avaliação; Apnéia do Sono Tipo Obstrutiva; Polissonografia.

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RESUMEN

Objetivo: Analizar la efectividad de la Escala de Somnolencia de Epworth (ESE) como recurso auxiliar en el diagnóstico del Síndrome de la Apnea Obstructiva del Sueño (SAOS). Métodos: Estudio observacional con una etapa retrospectiva y otra prospectiva con 475 pacientes que acudieron al Centro de Estudio del Sueño de Fortaleza (CESF). Los datos fueron recopilados a partir de las historias clínicas que se constituyen de cuestionarios incluyendo la ESE, creados por los profesionales del CESF y contestados por los pacientes. El estudio comparó los resultados obtenidos en la ESE con los datos de la polisomnografía. El análisis de los datos fue realizado a través del SPSS con el uso del Chi-cuadrado de Pearson, considerando como estadísticamente significativos los valores de p < 0,05. Resultados: El sexo masculino en la franja de edad entre 50 y 60 años y con el índice de masa corporal > 30 kg/m2 fueron los más comprometidos por el SAOS con respectivamente 38,9%, 41% y 45,1%. Fue evidenciada relación significativa entre la puntuación de la ESE y el SAOS (p = 0,001), señalando que el 25,9% (n = 123) de los pacientes que obtuvieron valores superiores a 10 en la ESE presentaron el diagnóstico de SAOS. Conclusiones: Los datos de esta investigación señalan que la ESE sirve como recurso auxiliar en el diagnóstico de la SAOS pudiendo ser utilizada por cualquier profesional sanitario durante las anamnesis clínicas. Sin embargo, la clinica del paciente no es suficiente para diagnosticarla, siendo necesaria la prueba de la polisomnografía.

Descriptores: Evaluación; Apnea del Sueño Obstructiva; Polisomnografía.

INTRODUCTION

The obstructive sleep apnea syndrome (OSAS) is defined by the occurrence of several episodes of apnea, with interruption of air flow of 10-second duration at minimum observed during nocturnal sleep and more than 30 times in a range of 7 hours[1]. It is estimated that OSAS affects 1.2% of women and 3.9% of men worldwide, with the ratio of 3:1 for male-female incidence[2]. The ratio equals after menopause and may increase with age[3].

The apnea-hypopnea (AHI) is used to classify OSAS, being obtained through polysomnography, by dividing the sleep hours into the total number of respiratory events. OSAS is classified as: mild - between 5 and 14.9 events / hour of sleep; moderate - between 15 and 30 events / hour of sleep, and severe - more than 30 events / hour of sleep[3,4].

The gold standard for diagnosis of OSAS is the assisted polysomnography (PSG), and its essential parameters established by electroencephalogram, electrooculogram and electromyogram[5,6]. Through PSG, are evaluated type, frequency and duration of apnea, snoring characteristics, the degree of oxygen desaturation, cardiac arrhythmias,

sleep fragmentation and severity of the condition[7]. The big problem of polysomnography is that it is not always well accepted by the patient, as it is an expensive and difficult to access exam[6].

In order to contribute to the evaluation of the OSAS condition, an Australian physician, Dr. W. Johns Murray, developed in 1991 the Epworth Sleepiness Scale (ESS)[6]. The ESS consists of a questionnaire that aims to quantify the likelihood of falling asleep in eight everyday situations, with values varying from 0 point (minimum) to 24 points (maximum), where 10 is considered the normality limit[6]. According to the author of the scale, the ESS is not subjective, but like any other method, the questionnaire will depend on the understanding, interpretation and honesty in the patient is responses. It's quick and easy to apply and without costs[6].

Bertolazi and colleagues performed a validation of the scale to Portuguese and confirmed ESS as a valid and reliable instrument for the assessment of daytime sleepiness[8].

The present study aimed to analyze the effectiveness of the Epworth Sleepiness Scale as an aid in the diagnosis of the obstructive sleep apnea syndrome.

METHODS

This is an observational study, comprising a retrospective and a prospective step, of quantitative analysis, with exploratory and diagnostic purposes. This research followed the precepts on research involving human subjects and was approved by ethics commitee of University of Fortaleza (Opinion, 278/07)[9].

The study included a total of 475 patients (n = 475), who were selected at the Sleep Study Center in Fortaleza (Centro de Estudo do Sono de Fortaleza - CESF). This site was chosen for study because it is a clinic specializing in the study object and has a large influx of patients with sleep disorders. The survey was conducted with patients who sought the CESF for probable diagnosis of a sleep disorder and included males and females of all ages. The study excluded cases of incomplete data, patients with concomitant diseases (heart or thyroid disease, chronic obstructive pulmonary disease and neurological conditions) and patients undergoing uvulopalatopharyngoplasty.

Data collection included the medical records of patients whose admission occurred in the period between October 2005 and June 2009. It took place from March 2008 to August 2009.

Data was collected from medical records, which included questionnaires designed by CESF professionals, based on models used in other polysomnography laboratories and recommended by the Brazilian Society of Sleep. Questionnaires were filled in previously by the

patients on the day of the exam. These questionnaires contained initially general information for registration, such as age, sex, education and marital status.

Subsequently, specific questions concerning the pre-sleep period were applied, which reported the events of the last 6 months related to the patient's daily life, such as sleep quality, memory, concentration, libido, mood, medications, smoking and use of drugs and alcohol. Then, inquiries were made about existing illnesses that could be related to OSAS, such as hypertension, heart disease, diabetes, among others.

The Epworth Sleepiness Scale (Table I), included among the questionnaires used in the institution, assesses the likelihood of patients dozing or falling asleep in some everyday situations.

The study compared the results obtained in the Epworth scale to the polysomnography data. The Epworth Sleepiness Scale scores *zero* to someone who has no chance of dozing, 1 for small chance of dozing, 2 for moderate chance of dozing and 3 for high chance of dozing. This score is evaluated on 8 everyday situations: sitting and reading; watching TV;

Table I – The Epworth Sleepiness Scale.

What is the probability of you snoozing or falling asleep in the following situations, comparing to just being tired? This is about your common lifestyle, in the present. And even if you haven't done it, or been through any of these situations, try to calculate how it could have affected you. Use the following scale to choose the appropriate number for each situation.

0 = no chance of snoozing	2 = moderated chance of snoozing
1 = small chance of snoozing	3 = high chance of snoozing

SITUATION	CHANCE OF SNOOZING
Sitting and reading:	_____
Watching TV:	_____
Sitting in a public place (eg waiting room, church):	_____
Like a passenger in a train, car or bus, walking one hour without stopping:	_____
Lying to rest in the afternoon, when circumstances allow:	_____
Sitting and chatting with someone:	_____
Calmly sitting after lunch with no alcohol:	_____
If you're driving, while you stop for a few minutes in a heavy traffic:	_____
TOTAL:	_____

Source: Mancini [15]

Table II - Descriptive measures of the characteristics observed in the patients, classified by gender.

Gender Descriptive measures	Age	Body Mass Index	Epworth Scale
Male			
Mean	44.0	29.2	10.1
Std. Deviation	15.5	5.6	5.1
Minimum	10	10.0	0
Maximum	87	61.0	24
Female			
Mean	48.1	28.0	9.4
Std. Deviation	14.8	6.7	5.1
Minimum	12	16.0	0
Maximum	80	59.0	24
Total			
Mean	45.6	28.7	9.8
Std. Deviation	15.4	6.1	5.1
Minimum	10	10.0	0
Maximum	87	61.0	24
p-value	0.003*	0.000*	0.128

sitting quietly in a public place without activity (waiting room, cinema, theater, meeting); as a passenger on a train, car or bus, walking an hour without stop; laying to rest in the afternoon, when circumstances allow; sitting and talking to someone; sitting quietly after lunch without drinking alcohol and, if you are driving, while stopping for a few minutes in heavy traffic.

The outcome was measured by adding the scores obtained in all the listed situations. It is important that the patient responds honestly, trying to differentiate the condition of being only tired. According to Echavarría[10] and Gus[11], a score greater than 10 is indicative of sleep disorders.

Data was tabulated and analyzed using the software *Statistical Package For Social Sciences*®, version 15.0 for Windows® (SPSS Inc., Chicago, IL, USA), based on descriptive and inferential statistics, presented in the form of graphs, tables and/or frames. The average was used considering the standard deviation and chi-square test was applied in the intersection of variables. Values of $p < 0.05$ were considered statistically significant.

RESULTS

The study included 475 patients, 61.3% (n = 291) were male and 38.7% (n = 184) were female. Patients' characteristics and mean values for ESS are described in Table II. With regard to fragmented sleep, 48.8% (n = 232) showed this disorder. The alveolar hypoventilation syndrome was present in only 4.4% (n = 21) of cases. While disorders such as restless legs syndrome, insomnia and bruxism were, respectively, present in 5.9% (n = 28), 3.8% (n = 18) and 2.9% (n = 14) of the studied subjects.

Regarding BMI analysis, it was observed that 1.7% (n = 8) of subjects were underweight, 28% (n = 133) with appropriate weight, 38.5% (n = 183) were overweight and 31.8% (n = 151) were obese.

Table III - Distribution of patients according to the characteristics observed, classified by gender.

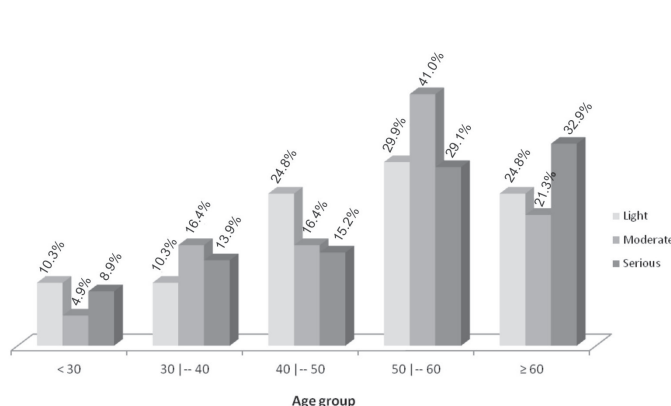| Variables	Gender				Total		p-value
	Male		Female				
	n	%	n	%	n	%	
Syndrome of Obstructive Sleep Apnea							
Light / Mild	79	16.6%	38	8.0%	117	24.6%	
Moderate	42	8.8%	19	4.0%	61	12.8%	
Serious / Severe	64	13.5%	15	3.2%	79	16.6%	0,000*
Lacks	106	22.3%	112	23.6%	218	45.9%	
Total	291	61.3%	184	38.7%	475	100.0%	

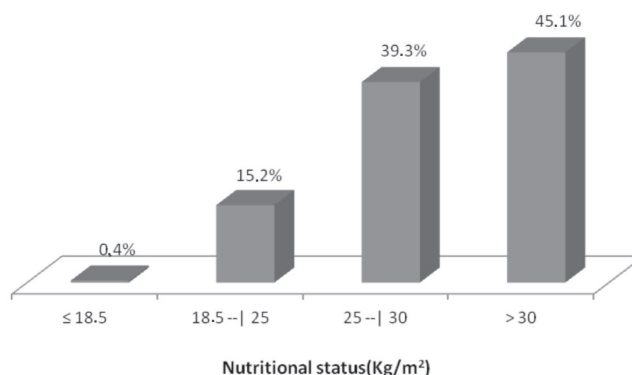Figure 1 - Severity of Syndrome of Obstructive Sleep Apnea, classified by age group.

Figure 2 - Distribution of patients diagnosed with the Obstructive Sleep Apnea Syndrome, according to nutritional status.
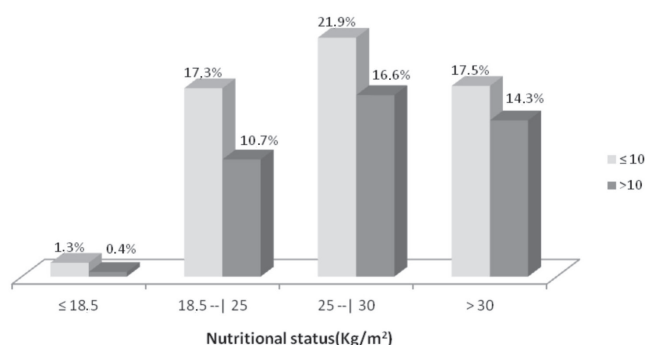
Figure 3 - Distribution of patients' scores in the Epworth scale, classified by nutritional status.

Figure 4 - Distribution of patients' scores in the Epworth scale, according to the obstructive sleep apnea syndrome.

As for the diagnosis of OSAS, 45.9% (n = 218) of the subjects did not show the syndrome, 24.6% (n = 117) of them were diagnosed with mild OSAS, 12.8% (n = 61) with moderate OSAS and 16.6% (n = 79) with severe OSAS. Table III lists the severity of OSAS compared to genre.

Through statistical analysis, it was found that 38.9% (n = 185) of men were diagnosed with OSAS, while this percentage is lower among women, being 15.2% (n = 72). These results show a statistically significant difference (p < 0.000) (Table III).

By correlating the diagnosis of OSAS with age and BMI, it was found that age and BMI > 30 kg/m^2 are predisposing factors to the development of OSAS (p < 0.001) (Figure 1 and 2).

Yet, when values of ESS above 10 are correlated with BMI, a higher prevalence (16.6%) was found for the group with BMI between 25 and 30 kg/m^2 (Figure 3). A significant relationship was found between the ESS score and OSAS (p = 0.001), showing that 25.9% (n = 123) of patients, who had values greater than 10 in the ESS, were diagnosed with OSAS (Figure 4).

The alveolar hypoventilation syndrome also showed a statistically significant difference when compared to the ESS (p = 0.02). But there was no statistically significant correlation between the ESS score and other variables related to sleep disorders (p > 0.05).

The sensitivity and specificity of ESS were, respectively, 47% and 64%. The positive predictive value of the scale reached 61% and the negative predictive value was 51%. The positive likelihood ratio of ESS was 134% and its accuracy was 55%.

DISCUSSION

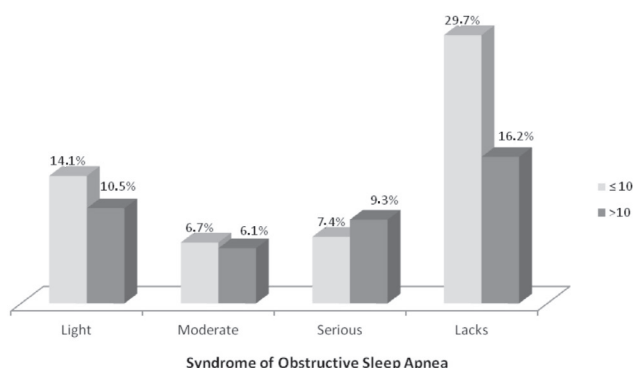This study corroborates the existing literature pointing to age, male gender and obesity as major factors predisposing to the development of OSAS, once it occurs most often among middle-aged men, aged between 30 and 60, with a peak incidence between 40 and 50, and is usually associated with obesity[1,3,12-15].

The mechanisms by which excess weight influences on this syndrome have not been fully elucidated. The suspicious is that there is a decrease in the size of the pharynx and that its collapsibility increases in obese individuals[16].

In the study of Fuhrman et al[17] and Larsson et al[18], the male / female ratio was 2.5:1, similar to the findings of this research. Bouloukaki evaluated the prevalence of OSAS in the Greek population and found a five times higher prevalence in men[19]. Recent studies point out that women may be underdiagnosed, for they express less complaining and present distinct symptoms, besides the stigma of OSAS being considered a disease of men[20,21,18].

Anatomical differences of the upper airways, hormone profile and the central type of fat distribution in men (trunk and neck) may justify higher incidence in males[22]. After menopause, the female becomes as affected as male[3]. Apparently, the progestin protects the pharyngeal collapse and testosterone appears to facilitate such collapse[23].

Research has suggested that the prevalence of sleep apnea increases with age while the clinical significance of apnea (gravity) decreases with age[24]. This finding contradicts the data of our study regarding the correlation between age and the severity of OSAS, where it was observed a linear growth of gravity as age increases.

The first analysis of the European Sleep Apnea Database (ESADA) showed that 72% of patients referred for polysomnography realization were obese men, with cardiovascular and metabolic diseases[25].

In this study, among the patients who sought the sleep assistance service, the most prevalent group was aged between 41 and 60 (45.3% of the sample). Studies

indicate that this is the stage of full professional activity, and perhaps this is why the symptoms of OSAS, such as daytime sleepiness, morning headaches and problems with memory and learning, interfere with social and working lives[3,26].

Sleep disorders can even compromise the public safety, since they directly influence the increase in the number of industrial and traffic accidents. Estimates in the number of accidents and deaths caused by sleepiness or fatigue vary from 2% to 41%, with a high cost in financial terms and in life, itself[14].

Due to data presented, the importance of applying the ESS is justified, in order to prevent such grievances. We believe that, through simple measures, such as performing adequate clinical history and directed physical examination, along with the implementation of the ESS, we can have a clearer idea on which patients may have sleep disorders.

Recent studies have demonstrated that ESS is a valid and reliable instrument for assessment of daytime sleepiness, thus corroborating this research[8]. According to Murray[27], author of the scale, the ESS is an objective assessment of sleepiness. However, like any other questionnaire-based method, it depends on the skill of reading, understanding and honest response of the patient[27].

Studies show that values above 10 in the ESS are indicative of daytime sleepiness, a major symptom of OSAS[28]. Researches have shown that the AHI was significantly associated with excessive daytime sleepiness, measured by ESS[29].

Some studies show that patients with diagnosis of OSAS, regardless its severity (mild, moderate, or severe), have obtained a high score in the ESS, confirming the findings of this research. However, other studies found no significant correlation between the ESS score and AHI[30]. In the study by Gondim[31], the ESS score of patients undergoing polysomnography was analyzed and it was found that 70% of patients who had an ESS score above 10 were diagnosed with OSA.

Our research is in agreement with the literature, for confirming that the ESS is not 100% sensitive[32]. A study by Echavarría[10] found that ESS had a sensitivity of 60%, specificity of 82%, positive predictive value of 85% and negative predictive value of 52%. The low sensitivity (50-60%) and low specificity (63-70%) of clinical diagnosis of sleep disorders points out a need of polysomnography for confirmation, with its sensitivity and specificity of approximately 95%[33]. The ESS can be considered as a useful proceeding for research and clinical practice and is now being used to screen for sleep disorders and also as an indicator for polysomnography[6,8].

CONCLUSION

Data from this study shows that the Epworth Sleepiness Scale fits as an auxiliary resource in the diagnosis of the obstructive sleep apnea syndrome, which can be applied by any health professional, during the clinical case histories. However, clinical signs are not sufficient to diagnose OSAS because of the low clinical sensitivity and specificity of questionnaires used in clinical services. Professionals should refer patients for polysomnography tests when he wants confirmation of suspected sleep disorders.

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