

Relation between Epworth Sleepiness Scale and Obstructive Sleep Apnea - A study conducted in PULSAR, KOLKATA

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ABSTRACT

737 adult persons more than 18 years of age of both gender, randomly selected from Kolkata, were put to Epworth Sleepiness Scale (ESS) questionnaire. 11.3% showed excessive daytime sleepiness (EDS) by ESS score. 74 polysomnographically diagnosed cases of obstructive sleep apnea (OSA), more than 18 years of age, showed presence of EDS in 81.1% of cases.

EDS, as calculated from ESS score, has good predictive value in assessing OSA and may be used as a screening tool in diagnosis of OSA. The ESS score of the diagnosed cases showed positive association with moderate and severe OSA cases.

Keywords: Obstructive sleep apnea, Excessive daytime sleepiness, Epworth sleepiness scale, Apnea – hypopnea index.

Introduction

Obstructive sleep apnea (OSA) is characterized by repetitive episodes of upper airway obstruction that occur during sleep and is usually associated with a reduction in blood oxygen saturation with associated features of daytime sleepiness and snoring.¹ Its importance has been recognized over the last two decades². Snoring, apneic spell and sleep fragmentation are cardinal features. Excessive daytime sleepiness (EDS), fatigue, morning headache, loss of concentration, memory loss are some of the other associated clinical features^{3,4}. EDS, one of the cardinal symptoms of OSA, is thought to result from sleep fragmentation due to recurrent central nervous system arousals in response to disturbed breathing events⁵.

Epworth Sleepiness Scale (ESS), a questionnaire-based scale, is used to assess individual propensity to sleepiness⁶. It describes individual's likelihood of dozing off at eight specific situations and scoring is done in each situation. Maximum total score possible is 24 (Table I). A total score of ten and above is considered to satisfy

the criteria for excessive daytime sleepiness^{7,8,9,10}.

Apnea-hypopnea (AHI) is one of the major criteria for diagnosis and measurement of severity of OSA. It includes total number of apneas and hypopneas per hour of sleep. Severity of OSA is graded as mild, moderate and severe according to AHI. AHI with 5-15, 15-30 and more than 30 per hour of sleep constitute mild, moderate and severe OSA respectively⁹.

Purpose of the study

It is well known that the gold standard for diagnosis of OSA is polysomnography where measure of AHI is a criteria for diagnosis and grading of OSA. But it is costly and sparsely available in a country like India. ESS score which may predict a population with EDS (ESS score \geq 10) would include a subset population of OSA in the EDS group. The present study wants to correlate the ESS score of polysomnographically diagnosed (AHI $>$ 5) OSA cases with the ESS score of a control group in the general population. The study also attempts to relate severity of OSA with EDS by ESS score, if any.

Material and Method

1000 adult people (18 years and above) of both gender were randomly selected from Kolkata and were put to ESS questionnaire (Table 1).

Table 1: Epworth Sleepiness Scale

How likely are you to fall asleep or doze off in the following situations, during the daytime in contrast to just feeling tired ? These questions refer to your usual way of life in recent months even if you have not done some of these things recently. Try to work out how they would have affected you.

Use the following scale to choose the most appropriate number for each situation.

- 0 = Would never doze off
- 1 = Slight chance of dozing
- 2 = Moderate chance of dozing
- 3 = High chance of dozing

| SITUATIONS | CHANCE OF DOZING (Write 0, 1, 2 or 3) |
|--|--|
| 1. Sitting and reading | |
| 2. Watching T V | |
| 3. Sitting inactive in a public place such as in a theater or meeting | |
| 4. As a passenger in a vehicle (bus/car) for an hour without a break | |
| 5. Lying down to rest in the afternoon when circumstances permit | |
| 6. Sitting, talking to someone | |
| 7. Sitting quietly after a lunch without alcohol | |
| 8. In a vehicle (bus/car) while stopped for a few minutes in a traffic jam | |
| Total score | |

37 people responded and the rest failed to report. The total ESS score was recorded on individual basis and the population was divided into “EDS” and “No EDS” group depending on ESS score ≥ 10 and < 10

respectively (Table 2).

Table 2: Data showing ESS score of 737 persons from Kolkata n = 737

| | NO EDS (ESS <10) | EDS (ESS ≥ 10) |
|--|---------------------|-------------------------|
| n = 737 | 654 (88.7%) | 84 (11.3%) |
| Male : Female | 394 : 260 (1.5 : 1) | 52 : 32(1.6 : 1) |
| Age in years (Mean \pm SD) | 47.3 \pm 11.5 | 47.7 \pm 13.2 |
| BMI in Kg/M ² (Mean \pm SD) | 24.7 \pm 2.1 | 24.3 \pm 3.9 |

74 people were found to be suffering from OSA as per polysomnographic criteria (AHI >5 per hour of sleep) amongst the patients who came or were referred to PULSAR, the sleep laboratory in Kolkata, for evaluation of their symptoms suggestive of OSA during the period from December 2000 – December 2001. They were put to ESS questionnaire, scoring were done in specific situations and the total score were recorded individually. Scores ≥ 10 and < 10 were computed separately signifying “EDS” and “No EDS” group respectively. (Table 3).

Table 3: Data showing ESS score of 74 persons having OSA n = 74

| | NO EDS (ESS < 10) | EDS (ESS ≥ 10) |
|---------------|----------------------|-------------------------|
| n | 14(18.9%) | 60 (81.8%) |
| Male : Female | 11 : 3 | 57 : 3 |

Result

ESS score of 737 randomly selected people (18 years and above) from Kolkata is summarized in Table II. They were put to “EDS” (ESS score ≥ 10) and “No EDS” group (ESS score <10). 654 (88.7%) persons were in “No EDS” and 84 (11.3%) were in “EDS” group.

Table 3 shows ESS score of 74 polysomnographically diagnosed OSA patients (18 years and above) of Kolkata and were put to “EDS” and “No EDS” group as before. 60 (81.1%) were in “EDS” and 14 (18.9%) were in “No EDS” group.

To compare the percentage of control population having “EDS” (11.3%) with corresponding percentage of “EDS” group of OSA people (81.1%), we first calculate the Standard Error of Proportion of the control group.

Table 4: Data showing gradation of OSA according to severity (as per AHI) and EDS and NO EDS group in each grade by ESS score
n = 74

| Mild OSA (AHI 5 – 15 / hour) n = 4 | | Moderate OSA (AHI 15-30 / hour) n = 12 | | Severe OSA (AHI >30/hour) n = 58 | |
|------------------------------------|---------------------------------|--|--------------------------------------|----------------------------------|----------------------------------|
| NO EDS (ESS < 10) n=4 (100%) | EDS (ESS ≥ 10) n = 0 (0%) | NO EDS (ESS < 10) n=2 (16.67%) | EDS (ESS ≥ 10) n = 10 (83.33%) | NO EDS (ESS < 10) n= 0(0%) | EDS (ESS ≥ 10) n=58 (100%) |
| Male Female | Male Female | Male Female | Male Female | Male Female | Male Female |
| 3 1 | Nil Nil | 2 Nil | 10 Nil | Nil Nil | 53 5 |

Standard Error of Proportion = $\sqrt{pq/n}$

Where p = percentage of persons having EDS of control group

q = percentage of persons having NO EDS of control group

n = sample size of control group

So, $\sqrt{pq/n} = \sqrt{11.3 \times 88.7/737} = \sqrt{1.359} = 1.17$

95% confidence limit = $2 \times 1.17 = 2.34$

Therefore, proportion of persons having EDS in control group is 11.3 ± 2.34 .

Our observed value of proportion of persons having EDS in OSA patients is 81.1 which is much higher and very significant.

Table 4 summarizes the OSA severity. The mild OSA group (n=4) has all 4 patients in “NO EDS” group (100%). The moderate OSA (n=12) has 10 patients in “EDS” group (83.33%) and 2 patients in “NO EDS” group (16.67%). The severe OSA (n=58) has all 58 patients in EDS group (100%).

Discussion

The population based controlled study of prevalence of EDS by ESS score as done in PULSAR, Kolkata, the first sleep laboratory in Eastern India, reflects EDS of 11.3% of the population. EDS prevalence have wide variation in different report (20% in one survey in Karachi, Pakistan and 31% in one survey in US)^{11,12}. The ESS score of polysomnographically diagnosed (AHI >5) OSA patient have 81.1% of patients with EDS in our study. As the proportion of persons having EDS in control group is 11.3 ± 2.34 , which is much lower than the proportion of persons having EDS in OSA patients (81.1), we may conclude that EDS as calculated by ESS

score has good predictive value in assessing OSA patients. As polysomnography (PSG), the gold standard for OSA diagnosis, is costly and has a very limited availability, EDS as calculated by ESS score may be used as a good screening tool for subsequent diagnosis of OSA by PSG. One study, conducted in AIIMS, New Delhi, concludes that patients with OSA has significant higher ESS score¹³. However, a study from Michigan, USA concludes that ESS score may not reflect objective measure of sleepiness or sleep apnea¹⁴.

The present study also shows that the moderate and severe OSA patients have more number of “EDS” (83.33% in moderate and 100% in severe cases) compared to mild OSA where all 4 patients were in the “No EDS” group suggesting that ESS score has positive association with moderate to severe OSA cases. Vancouver sleep study center, British Colombia, has also similar view like us. They suggest that in OSA, ESS >16 was seen only in patients with moderate to severe disease¹⁵. So, from Our study we can also conclude that OSA patients presenting with EDS by ESS score have more chance of having moderate to severe diseases.

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