

The Berlin Questionnaire is a more sensitive tool than the Epworth Sleepiness Scale for screening Obstructive Sleep Apnea

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Abstract

Background: Obstructive sleep apnea syndrome (OSAS) remains a highly under-diagnosed clinical entity since many clinicians use sleep questionnaires for diagnosis, instead of the gold standard, albeit expensive test, polysomnography. This study compared the efficacy of two such questionnaires in diagnosing OSAS.

Material and methods: The Epworth Sleepiness Scale (ESS) was compared with Berlin Questionnaire (BQ) in this study. Patients with sleep disordered breathing were asked to fill up both ESS and BQ. Subsequently they underwent Level 1 polysomnography. The Apnea Hypopnea Index (AHI) thus obtained was used to compare the ESS and BQ for their sensitivity in screening for OSA.

Result: Out of a total of 55 patients, 34 true positives were detected by ESS and 46 by BQ (68% and 92% sensitivity respectively).

Conclusion: It was found that BQ was a tool with greater sensitivity than ESS in screening for OSA in the Indian population.

Keywords: OSAS, Epworth Sleepiness Scale, Berlin Questionnaire.

1. Introduction

Obstructive sleep apnea syndrome (OSAS) is defined as the repetitive occurrence of complete or partial obstruction of the upper airway during sleep.[1] It is prevalent in 1-4% of middle aged males and is about half as common in women.[2] Chronic untreated OSAS is associated with sleep and cognitive disturbances and increased daytime sleepiness. These effects are reflected as decreased work performance [3], increased accidents [4] and diminished quality of life [5,6] and are mainly attributed to the fragmented sleep and nocturnal hypoxemia. The gold standard for diagnosing OSAS is to perform a Level 1 polysomnography (PSG) which includes recording the respiratory and other neurophysiologic signals during sleep. In many countries the PSG is limited by recording only the respiratory events and oxygen saturation which has proven to be cost effective.[2] In many centres without the facility to perform PSG the diagnosis is dependent on obtaining a detailed sleep history from the patient and the partner by using sleep questionnaires like the Epworth Sleepiness Scale and physical examination to eliminate differential diagnoses of OSAS, like obesity,

hypothyroidism, hypertension, cranio-facial deformity etc. The Epworth Sleepiness Scale (ESS) as the name suggests is designed to evaluate excessive daytime sleepiness by making the subject score the probability of drifting to sleep on a scale of 0-3, with 3 implying very high chance of dosing and 0 for absolutely no chance of dosing, in 8 different hypothetical situations during the day. A score of ≥ 10 is considered to be excessively sleepy during the day and the person is advised to seek medical attention.[7] ESS is the most widely used sleep assessing tool in clinics and in most sleep labs. But ESS has its own disadvantages. It is not etiology specific, and is just an indicator of excessive day time sleepiness. Also, this scale is entirely dependent on the patient's history, which may be subjective, and no objective parameters are taken into consideration for diagnosis. In view of these shortcomings of the ESS, search for a more suitable tool to diagnose sleep disordered breathing like OSAS is called for.

2. Materials and Methods

2.1 Methodology

The Berlin Questionnaire (BQ) was chosen as an alternative tool to be compared with ESS, in its efficiency of diagnosing OSAS. BQ was selected because, unlike ESS, it also includes objective parameters like increased BMI (BMI>30) and high BP as criteria to diagnose OSAS and it is etiology-specific (designed to diagnose OSAS). Patients with symptoms suggestive of OSAS were referred from Pulmonology department. They were asked to fill up both the ESS and BQ. Then their anthropometric parameters and vital signs were recorded and subsequently they underwent an in-lab attended full montage polysomnography test, scored manually as per American Academy of Sleep Medicine (AASM) criteria. The Apnea Hypopnea Index (AHI) was calculated for the entire period of the study.

2.2 Statistical analysis

The AHI thus obtained was used as the gold standard to diagnose OSAS, and based on this a sensitivity analysis of ESS and BQ was carried out using SPSS 17 software. The two questionnaires were compared for their sensitivity in screening for OSAS.

3. Results

A total of 55 patients underwent polysomnography, out of which 37 had ESS score of >9 (high possibility of having a sleep disorder according to ESS criteria) 49 were more than 1 category positive (1 CAT +ve) according to BQ (high likelihood of having OSA) and 51 had apnea-hypopnea index ≥ 5 (at least mild OSA) after scoring the PSG (Table 1).

Table 1: Frequency distribution of cases satisfying the criteria of ESS, BQ and AHI in diagnosing OSAS

| No. of patients screened | ESS ≥ 10 | BQ > 1 CAT +ve | AHI > 5 |
|--------------------------|---------------|----------------|---------|
| 55 | 37 | 49 | 51 |

The number of true positives (sensitivity) detected by ESS and BQ were 35 and 47 respectively (Table 2).

Table 2: Shows the sensitivity and specificity of ESS and BQ

| | AHI < 5 | AHI ≥ 5 |
|----------------------|---------|--------------|
| ESS < 10 | 2 | 16 |
| ESS ≥ 10 | 2 | 35 |
| | AHI < 5 | AHI ≥ 5 |
| BQ ≤ 1 category | 2 | 4 |
| BQ > 1 category | 2 | 47 |

The false negatives (specificity) using ESS was 16 which was more when compared to 4 by BQ

4. Discussion

The sensitivity of ESS in picking up OSA was 67.2%, while that of BQ was 89% as seen in this study. Also the number of false negatives with ESS was 4 times more

than BQ, which contributed to the decrease in the sensitivity of ESS.

It should be reiterated at this stage that the ESS is entirely patient’s history dependent and subjective. After analysing both the scales (ESS and BQ) it was noted that some patients tend to underplay their symptoms or are unaware of their symptoms, thus resulting in a reduction in their score. Since BQ included objective parameters like BP and BMI, which can be measured and quantified, its sensitivity was much higher than ESS. It is worth noting that these objective parameters also contribute to the pathogenesis of sleep disordered breathing. When analysing ESS it was also observed that the mean score of the 55 subjects for the question ‘chances of dozing when in a car, while stopping for a few minutes in traffic was 0.45 (0 = would never doze, 1 = slight chance of dozing, 2 = moderate chance of dozing, 3 = high chance of dozing). This question got the lowest mean score compared to other questions. At the same time it should be kept in mind that 92% of the responders were shown to have at least mild OSAS by PSG. This can be possibly attributed to the fact that the traffic signal waiting time in small cities and towns in India is much less, so the possibility of drifting to sleep also becomes less. This raises questions about the validity of a globally accepted scale like the ESS in the local Indian context. One solution to such a problem would of course be to modify the existing tool to suit the purpose. On the other hand, when a more specific and sensitive tool like the Berlin Questionnaire is available, one would want to suggest the use of such a tool to be preferred over the Epworth Sleepiness Scale.

5. Conclusion

This study concludes that ESS is not specific for diagnosing OSAS and not as sensitive as BQ in picking up OSAS. It is therefore suggested that the internationally accepted sleep scales could be modified to suit the regional population. It is also suggested that clinicians or sleep lab technicians use the Berlin Questionnaire, which has been proved to be a better tool in screening for sleep disordered breathing.

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