The Utility of Epworth Sleepiness Scale to Screen Moderate and Severe Obstructive Sleep Apnea Preoperatively to Predict Difficult Airway

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Abstract

Introduction Obstructive sleep apnea (OSA) is sleep-disordered breathing characterized by repetitive episodes of partial or complete upper airway collapse in sleep leading to apnea and/or hypopnea, desaturations, sleep disruptions, and cardiovascular changes. OSA is a known cause for difficult airway, especially mask ventilation. Daytime sleepiness is one of the hallmark symptoms of OSA. So, we used the Epworth sleepiness score (ESS) in patients suspected of OSA undergoing a sleep study.

Methods Overall, 44 subjects suspected to have OSA and undergoing polysomnography were included in the study. The socio-demographic details and the complaints were recorded and the Epworth sleepiness questionnaire was administered. The severity of OSA was graded as per the American Academy of Sleep Medicine using the apnea hypopnea index.

Results A total of 44 patients were included in the study. Out of these, 19 were mild, 13 moderate, and 12 severe OSA cases, respectively. ESS of more than 10 showed a positive predictive value of 81.25% and specificity of 85% in screening patients with moderate and severe OSA. But the sensitivity and negative predictive value was only 54.16 and 60.71%, respectively.

Conclusion ESS being a simple questionnaire can be easily used preoperatively. A score of more than 10 effectively diagnoses moderate and severe OSA, but less than 10 cannot rule out OSA

Keywords
- OSA
- preoperative
- questionnaire

Introduction

Obstructive sleep apnea (OSA) is sleep-disordered breathing characterized by repetitive episodes of partial or complete upper airway collapse in sleep leading to apnea and/or hypopnea, desaturations, sleep disruptions, and cardiovascular changes. OSA is a known cause for difficult airway, especially mask ventilation, and is more prevalent in males, obese, elderly, craniofacial deformities, neuromuscular disorders, alcohol consumption, etc.[1] Approximately 80% of OSA are undiagnosed and may pose serious challenges during induction and recovery due to the airway collapse.[2,3] Daytime sleepiness is one of the hallmark symptoms of OSA leading to various health hazards. Epworth sleepiness score (ESS) is an

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objective way to grade daytime sleepiness. It is a questionnaire being administered to subjects and graded as per the points they have scored. A score of 10 and less is normal, 11 to 13 is mild daytime sleepiness, 14 to 15 is moderate daytime sleepiness, and 16 or more is severe daytime sleepiness.[4] So, we used the ESS in patients suspected of OSA undergoing a sleep study.

Methods

After obtaining ethical committee clearance, we conducted this study in a tertiary care hospital. Overall, 44 subjects suspected to have OSA and undergoing polysomnography were included in the study. The socio-demographic details and the complaints were recorded and the Epworth sleepiness questionnaire (►**Table 1**) was administered. ESS is a questionnaire consisting of eight questions each graded from 0 to 3. The minimum score is 0 and the maximum score 24. The patients were asked the questions and asked to grade their sleepiness for each scenario. In case the patient was unable to comprehend the questionnaire, they were excluded from the study. The subjects then underwent overnight polysomnography and the severity of OSA was graded as per the American Academy of Sleep Medicine using apnea hypopnea index (AHI).

The data were tabulated in an MS Excel sheet and demographic details and complaints are depicted as frequencies and percentages. Daytime sleepiness and severity of OSA are depicted as frequencies and percentages. ESS and AHI were correlated using Spearman's correlation. Body mass index (BMI) and ESS were correlated using Pearson's correlation. ESS with a score of more than 10 was used as a test to screen moderate and severe OSA.

Table 1 Epworth sleepiness score

Name:	**Today's date:**
Your age (y):	Your sex:
How likely are you to doze off or fall asleep in the following situations, in contrast to feeling just tired? This refers to your usual way of life in recent times. 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 1 = *slight* chance of dozing 2 = *moderate* chance of dozing 3 = *high* chance of dozing	
Situation	Score
Sitting and reading	
Watching TV	
Sitting, inactive in a public place (e.g., a theater or a meeting)	
As a passenger in a car for an hour without a break	
Lying down to rest in the afternoon when circumstances permit	
Sitting and talking to someone	
Sitting quietly after a lunch without alcohol	
In a car, while stopped for a few minutes in the traffic	

Results

A total of 44 patients were included in the study. Out of these, 19 were mild, 13 moderate, and 12 severe OSA cases, respectively. Demographic details (►**Table 2**) and complaints (►**Table 3**) show that 68.18% are males. The majority of them are in the age group 18 to 33 years followed by 48 to 63 years.

Table 2 Demographic data

Demographic details	Group	Frequency	Percentage
Age	18–33 y	16	36.36
	33–48 y	11	25
	48–63 y	15	34.09
	63–78 y	2	4.54
Sex	Males	30	68.18
	Females	14	31.81
BMI (kg/m^2)	14.9–21	11	25
	21–27.1	12	27.27
	27.1–33.2	12	27.27
	33.2–39.3	8	18.18
OSA severity	Mild	19	43.18
	Moderate	13	29.54
	Severe	12	27.27
Daytime sleepiness	Normal (ESS ≤10)	28	63.63
	Mild (ESS 11–12)	10	22.72
	Moderate (ESS 13–15)	4	9.09
	Severe (ESS ≥16)	2	4.54

Abbreviations: BMI, body mass index; ESS, Epworth sleepiness score; OSA, obstructive sleep apnea.

Table 3 History of the subjects

Complaints	Yes	No
Snoring	42	2
Positional variation of snoring	13	31
Obstructive episodes	25	19
Arousal/nocturnal choking	24	20
Excessive daytime sleepiness	32	12
Intellectual deterioration	0	44
Personality changes	8	36
Abnormal motor movements	4	40
Morning headaches	15	29
Nocturnal enuresis/impotence	1	43
Nasal obstruction	31	13

Our findings showed that 50% of the severe OSA cases had an ESS of more than 13, that is moderate to severe daytime sleepiness, whereas the remaining 50% of the severe OSA cases had mild or normal daytime sleepiness. However, all the mild OSA cases had mild or normal daytime sleepiness. Further, in mild OSA, 80% of them had no daytime sleepiness whereas only 20% had mild daytime sleepiness.

The ESS of more than 10 showed a positive predictive value (PPV) of 81.25% and specificity of 85% in screening patients with moderate and severe OSA. But the sensitivity and negative predictive value (NPV) was only 54.16 and 60.71%, respectively.

Discussion

OSA is one of the important causes of difficult mask ventilation and hence difficult airway. If suspected, it can lead to more preparedness in the form of keeping oral airway, laryngeal mask airway, and preferring faster-acting muscle relaxants like succinylcholine or rocuronium during the general anesthetic procedure. OSA patients are more sensitive to benzodiazepines and opioids precluding their use to a minimum. Also, they may pose a challenge in postoperative care due to the airway collapse during sleep and subsequent desaturations. So awake extubation should be done whenever possible. The nasopharyngeal airway may be helpful in case of upper airway collapse in the postoperative period. Hence preanesthetic evaluation with high suspicion in susceptible individuals is of paramount importance.

Our study showed that the majority of the diagnosed OSA were males (68.18%) compared with females (31.8%), which is similar to the study by Kapsimalis and Kryger showing that one-third of diagnosed OSA patients are females.[5] Although sleep-disordered breathing is known to be more prevalent in the elderly, there were only 2 patients (4.54%) between 63 and 78 years of age.[6] This could be explained by the fact that the elderly, being concerned about other more severe health issues, do not seek help for sleep-disordered breathing and its consequence. Pearson's correlation coefficient between BMI and ESS is 0.190 (weak correlation) with a *p*-value of 0.222 (not significant). This is similar to the study by Dagan et al showing a poor correlation between higher BMI and subjective daytime sleepiness; however, they showed that there was a correlation between increased BMI and shorter sleep latency times.[7]

Although 32 patients were complaining of excessive daytime sleepiness, only 16 had daytime sleepiness as per ESS. This is similar to a study by Mediano et al, showing that the majority of patients with OSA complaining of excessive daytime sleepiness fail to show it as per ESS.[8] Although the majority of studies have shown no correlation between ESS and AHI and Guo et al showed a strong correlation between weighted ESS and AHI, our study showed that Spearman's correlation coefficient between ESS and AHI is 0.54 (moderately correlated).[9-13]

Previous studies have shown that subjective daytime sleepiness scores cannot be used to screen OSA.[10-12] Also, ESS cannot be used to screen OSA in subjects with a history of snoring.[14] Mild OSA may not pose much risk perioperatively, but moderate and severe OSA are prone to airway-related complications. Hence, we used ESS with a score of more than 10 to screen moderate and severe OSA. This showed a PPV of 81.25% and specificity of 85%, which means that ESS can be efficiently used as a screening modality perioperatively. All patients with ESS of more than 10 should be managed cautiously concerning airway-associated problems perioperatively. The sensitivity and NPV was only 54.16 and 60.71%, respectively; hence some patients with moderate and severe OSA might have been missed while screening. These values are similar to other studies.[15] Other corroborative features like history and physical examination along with the questionnaire may be used to pick these cases. A study by Senaratna et al opined that STOP-BANG, Berlin's questionnaire, and OSA-50 questionnaire, along with ESS of more than or equal to 8, can be used to rule in but not rule out clinically relevant OSA, similar to our results.[16]

The limitation of our study was that we included subjects with suspected OSA undergoing polysomnography and hence included all subjects with AHI of more than 5, and none were less than 5.

Conclusion

ESS being a simple questionnaire can be easily used preoperatively. A score of more than 10 effectively diagnoses moderate and severe OSA, but less than 10 cannot rule out OSA.

Note
This work was primarily carried out at K.S. Hegde Medical College.

Conflict of Interest
None declared.

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