Original Article   Obstructive Sleep Apnea

Mallampatti Score as a Predictor for Risk of Obstructive Sleep Apnea

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ABSTRACT

Objective: To observe the association of high Mallampatti score with obstructive sleep apnea and to see its predictive value for high risk individuals.

Study Design: A Prospective Cross Sectional Study.

Place and Duration of Study: This study was conducted at the Department of Anaesthesia Bahawal Victoria Hospital Bahawalpur, from July, 2017 to January, 2018.

Materials and Methods: Body mass index was calculated from weight and height. Mallampatti score was evaluated besides Berlin questionnaire, snoring, Epworth sleeping scale. Patients were divided into four groups on the basis of Mallampatti score. Mallampatti score was cross tabulated against snoring grades, Berlin score risk, Epworth score classes and body mass index categories and was compared by applying Chi-square test. SPSS v.23 was used, considering $p \leq 0.05$ statistically significant.

Results: In group III and IV of Mallampatti score, there was significantly more snoring of grade III and grade IV (p=0.043). Mallampatti score difference was not statistically significant among normal, overweight and obese persons (p=0.962). On the basis of Berlin Score risk, the difference was not found to be of any statistical significance (p=0.366). There was a statistically significant increase in Mallampatti score when we moves from class I to class IV of Epworth Sleep Score (p=0.031).

Conclusion: We concluded that high Mallampatti score is greatly interrelated with snoring and high Epworth sleep score. This shows a strong relationship between high Mallampatti score and obstructive sleep apnea. Therefore, Mallampatti score can be used to predict the risk of obstructive sleep apnea.

Key Words: Obstructive Sleep Apnea, Mallampatti Score, Epworth Sleep Score, Berlin Score

INTRODUCTION

Episodic fractional or complete obstruction of the respiratory tract during sleep characterize a condition called obstructive sleep apnea (OSA). During inspiration, when negative airway pressure exceeds the muscular expanding pressure, airway collapses and obstructive sleep apnea occurs[1,2]. The level of obstruction can be at uvula, above or below it or all the way through upper respiratory tract. There is a positive correlation of obstructive sleep apnea with age and obesity. Obesity is inversely related to the pharyngeal area. The smaller the size of pharynx and upper airway is, the greater the negative pressure develops, considering the equivalent inspiratory stream. There might be some neurogenic base for this disorder [3]. There may be inadequate neuronal drive to the airway dilator muscles or its incoordination with the neuronal drive to the muscles of diaphragm.

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Although obstructive sleep apnea can occur in any stage of sleep, but it happens more during the rapid eye movement sleep. The situation can be improved by applying the nasal continuous airway pressure, as it increases the upper respiratory tract pressure and maintains the airway patency [4].

If there is loss of tone of pharyngeal musculature and fractional collapse of pharynx but it is still able to let the inspired air to move around the epiglottis, tongue or uvula, it will result in the occurrence of hypopnea and snoring. During sleep, the occurrence of hypopnea and apnea is known as sleep-disordered breathing (SDB). Patient awakes from sleep due to increase in the inspiratory exertion and arterial hypercapnia and hypoxemia, as it is necessary to survive the apneic spell. This stimulates the sympathetic nervous system, resulting in pulmonary hypertension and myocardial ischemia, cardiac arrhythmias and sudden death [5]. There may be reflux from the high pressure stomach to the low pressure esophagus. The symptoms of obstructive sleep apnea depend on the individual experience, which includes sleep cycles, airway obstruction, awakening, re-establishment of breathing and again going to sleep. This all leads to the low quality of sleep and increase in sleepiness during the day and early morning headaches, poor work

performance, and increased tendency to work-related and domestic mishaps [6].

Obesity and old age are increasing now a days due to which obstructive sleep apnea incidence is on the rise [10]. In USA, there has been observed a rise in obesity and high body mass index, even in children [7]. Anesthesiologists are especially concerned about this issue because it can lead to excessive perioperative morbidity and mortality [8]. In almost eighty percent of the patients, obstructive sleep apnea is not diagnosed and there is need to be aware of the clinical presentation and symptomatology of obstructive sleep apnea [9]. It can be present in young and apparently healthy persons. Obstructive sleep apnea can be diagnosed clinically in up to sixty percent of the patients but the conformation requires laboratory testing. The pattern of snoring, too much daytime somnolence, observation of sleep apnea and body mass index >35 are very much suggestive of obstructive sleep apnea. The gold standard test to diagnose obstructive sleep apnea is polysomnography. For the identification of high risk patients, likely to develop obstructive sleep apnea, Epworth and Berlin questionnaires have been developed. During general physical examination, high Mallampatti Score was seen in patients presenting with obstructive sleep apnea [10].

Some studies suggested that Mallampatti score could be used independently to assess the risk of obstructive sleep apnea, while some suggested otherwise. Polysomnography is an expensive test and requires overnight stay at the hospital. There is lack of data on the association of Mallampatti score and obstructive sleep apnea. We aim to look for a cost effective way for the diagnosis of obstructive sleep apnea in a developing country like Pakistan.

MATERIALS AND METHODS

It is a prospective questionnaire based study conducted in Department of Anaesthesia Bahawal Victoria Hospital Bahawalpur, from July, 2017 to January, 2018, after taking permission from the Department ethical committee. Sample size was calculated by using the study by Naqvi SU et al [14] as reference. A total of one hundred and thirty four individuals was selected randomly. Medical students, medical staff and old patients of both the genders were part of our study.

Informed consent was obtained from all the participants. Mallampatti score was evaluated besides Berlin questionnaire, snoring, Epworth sleeping scale. Height and weight of every participant was noted to calculate body mass index. Every participant was asked to sit, open the mouth and protrude the tongue, to the maximum extent. The structures visible were noted. No tongue depressor was used. The score was assessed using the modified Mallampatti score. (Table-I)

The patients who had past history of oro-dental surgery and tonsillectomy, acromegaly, facial fractures, epilepsy, cleft lip, cleft palate, dental prosthesis, and children as well as pregnant women were excluded from our study.

Age, gender, weight and height were measured. Body mass index was calculated from weight and height. Patients were divided into four groups on the basis of Mallampatti score. Descriptive data was compared among the groups by ANOVA test. Mallampatti score was cross tabulated against snoring grades, Berlin score risk, Epworth score classes and body mass index categories and was compared by applying Chi-square test. SPSS v.23 was used, considering p≤0.05 statistically significant.

RESULTS

One hundred and thirty four candidates were recruited in our study. All the candidates were divided into four group on the basis of Mallampatti Score. All four groups were comparable in terms of mean age (p=0.859) and male to female ratio (p=0.323). Mean body mass index was significantly more in Group IV in comparison with other groups (p=0.016). (Table-2)

In group III and IV of Mallampatti score, there was significantly more snoring of grade III and grade IV (p=0.043). Mallampatti score difference was not statistically significant among normal, overweight and obese persons (p=0.962). On the basis of Berlin Score risk, the comparison was done between low risk and high risk candidates and the difference was not found to be of any statistical significance (p=0.366). There was a statistically significant increase in Mallampatti score when we moves from class I to class IV of Epworth Sleep Score (p=0.031). (Table-3).

Table No.1: Modified Mallampatti Score

Class	Structures Visible
I	Hard Palate, Soft Palate, Uvula, Fauces, Pillars
II	Hard Palate, Soft Palate, Uvula, Fauces
III	Hard Palate, Soft Palate, Base of Uvula
IV	Only Hard Palate

Table No.2: Baseline Characteristics of Four Mallampatti Score Groups

Variable	I (n=37)	II (n=42)	III (n=30)	IV (n=25)	p-value
Age (years)	41.05 ±8.85	39.71±8.87	39.40±8.31	40.12±7.33	0.859
Male	15 (40.54)	25 (59.62)	13 (43.33)	11 (44)	0.323
BMI (kg/m^2)	23.24 ±2.91	23.71±2.72	24.57±3.63	26.12±5.49	0.016

Variables are **mentioned** as Mean ± S.D or Number (Percentage); BMI=Body Mass Index; Chi-Square test and ANOVA test applied.

Table No.3: Comparison of Mallampatti Score and other General Characteristics of the Candidates

Snoring	Mallampatti Score				p-value
	I(n=37)	II(n=42)	III(n=30)	IV(n=25)	
I	12 (32.4)	12 (28.6)	8 (26.7)	6 (24)	0.043
II	13 (35.1)	15 (35.7)	4 (13.3)	3 (12)	
III	6 (16.2)	11 (26.2)	14 (46.7)	8 (32)	
IV	6 (16.2)	4 (9.5)	4 (13.3)	8 (32)	
BMI, Kg/m^2					
Normal	15 (40.5)	13 (30.9)	10 (33.3)	7 (28)	0.962
Over weight	11 (29.7)	13 (30.9)	9 (30)	8 (32)	
Obese	11 (29.7)	16 (38.1)	11 (36.7)	10 (40)	
Berlin Score Risk					
High Risk	10 (27)	12 (28.6)	7 (23.3)	11 (44)	0.366
Low Risk	27 (73)	30 (71.4)	23 (76.7)	14 (56)	
Epworth Sleep Score					
I	20 (54)	15 (35.7)	8 (26.7)	3 (12)	0.031
II	7 (18.9)	14 (33.3)	7 (23.3)	5 (20)	
III	5 (13.5)	6 (14.3)	8 (26.7)	9 (36)	
IV	5 (13.5)	7 (16.6)	7 (23.3)	8 (32)	

Variables are mentioned as Number (Percentage); BMI=Body Mass Index; Chi-Square test was applied.

DISCUSSION

Out of one hundred and thirty four individuals, forty five were of normal body mass index, forty one were overweight and forty eight were obese. The difference in the Mallampatti score was not any different in all these groups. However, there was significant snoring in the patients who had high mallampatti score. Snoring is caused by partial upper airway obstruction, this shows that the obstructive sleep apnea is more likely to develop in people with high Mallampatti score. Sleep apnea score was also significantly high in high Mallampatti score class, as observed by Epworth Sleep Scale. This all shows that the patients who had high mallampatti score were at greater risk of developing obstructive sleep apnea. Berlin score was not associated with any risk of obstructive sleep apnea or high Mallampatti score. Females were more in number in high mallampatti score class but the difference was not statistically significant in between both the genders.

The relationship of berlin score with obstructed sleep apnea was studied by Thurtell MJ et al.[10] and they found it to be statistically significant. For emergency screening, Berlin score questionnaire and Epworth sleep scale are very important parameters[11]. A quick idea about the condition of the patient can be made before any emergency intervention requiring anesthesia. A study conducted by Lee SJ et al.[12] showed that the Epworth sleep scale was 93.4% sensitive and is a useful scale to assess the risk of obstructive sleep apnea.

In contrast to current study, Bins S. et al[13] conducted a study in 2011 and put forth the conclusion that

Mallampatti score was no significant enough to be used for the prediction of risk of obstructive sleep apnea syndrome. A few surveys, which were conducted after this time, opposed the results of above mentioned study. Naqvi SU et al[14] conducted a study in 2016 which was published in 2018. It was observed in that study that the Berlin score risk and Epworth sleep scale score was negatively associated with high Mallampatti score. But Mallampatti score was significant to rule out obstructive sleep apnea in low risk category patients of Berlin Score and Epworth sleep scale score. However, there was positive association of high Mallampatti score and snoring. Body mass index did not significantly affect the Mallampatti score.

Barceló X et al[15] in their study showed the modified Mallampatti score was useful in assessing the severity of obstructive sleep apnea syndrome, which can be estimated by simple oral examination. A positive predictive value of Mallampatti score was observed in a study by Myers KA et al[16] and it was 9.3. Rodrigues MM[17] studied 168 patients. All of these patients had undergone polysomnography test. When their modified Mallampatti score was plotted against obstructive sleep apnea score, there was strong association between high mallampatti score along with nasal obstruction and obstructive sleep apnea syndrome. However, nasal obstruction alone was not significantly associated with high mallampatti score.

CONCLUSION

We concluded that high Mallampatti score is greatly interrelated with snoring and high Epworth sleep score. This shows a strong relationship between high Mallampatti score and obstructive sleep apnea. Therefore, Mallampatti score can be used to predict the risk of obstructive sleep apnea**.**

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REFERENCES

1. Bilston LE, Gandevia SC. Biomechanical properties of the human upper airway and their effect on its behavior during breathing and in obstructive sleep apnea. J Appl Physiol 2014; 116(3):314-24.
2. Oliven R, Cohen G, Dotan Y, et al. Alteration in upper airway dilator muscle co-activation during

sleep: comparison of patients with OSA and healthy subjects. J Appl Physiol 2017.

3. Aboussouan LS. Sleep-disordered breathing in neuromuscular disease. Am J Respir Crit Care Med 2015;191(9):979-89.

4. Ashaat S, Al-Jumaily AM. Reducing upper airway collapse at lower continuous positive airway titration pressure. J Biomech 2016;49(16): 3915-22.

5. Chen X, Pensuksan WC, et al. Obstructive sleep apnea and multiple anthropometric indices of general obesity and abdominal obesity among young adults. Int J Soc Sci Stud 2014;2(3):89.

6. Obaseki DO, Kolawole BA, et al. Prevalence and predictors of obstructive sleep apnea syndrome in a sample of patients with type 2 Diabetes Mellitus in Nigeria. Nigerian Med J 2014;55(1):24.

7. Turer CB, Lin H, Flores G. Prevalence of vitamin D deficiency among overweight and obese US children. Pediatrics 2013;131(1):e152-61

8. Opperer M, Cozowicz C, Bugada D et al. Does obstructive sleep apnea influence perioperative outcome? A qualitative systematic review for the Society of Anesthesia and Sleep Medicine Task Force on Preoperative Preparation of Patients with Sleep-Disordered Breathing. Anesth Analg 2016; 122(5):1321-34.

9. Vest D, Lee D, Newcome K, Stamper H. A retrospective review of difficult intubations: is obstructive sleep apnea a predictor? Clin Nurse Spec 2013;27(3):128-31.

10. Thurtell MJ, Bruce BB, Rye DB, Newman NJ, Biousse V. The Berlin questionnaire screens for obstructive sleep apnea in idiopathic intracranial hypertension. J Neuroophthalmol 2011;31(4): 316-9.

11. El-Sayed IH. Comparison of four sleep questionnaires for screening obstructive sleep apnea. Egyptian J Chest Dis Tuberculosis 2012; 61(4):433-41.

12. Lee SJ, Kang HW, Lee LH. The relationship between the Epworth Sleepiness Scale and polysomnographic parameters in obstructive sleep apnea patients. Eur Arch Otorhinolaryngol 2012; 269(4):1143-7.

13. Bins S, Koster TD, de Heij AH, et al. No evidence for diagnostic value of Mallampati score in patients suspected of having obstructive sleep apnea syndrome. Otolaryng Head Neck 2011;145(2): 199-203.

14. Naqvi SU, Shahab A, Zia S, et al. Association of Mallampatti score as a risk factor for obstructive sleep apnea. Rawal Med J 2018;43(1):18-22

15. Barcel X, Mirapeix RM, Bugés J, Cobos A, Domingo C. Oropharyngeal examination to predict sleep apnea severity. Arch Otolaryngol Head Neck Surg 2011;137(10):990-6.

16. Myers KA, Mrkobrada M, Simel DL. Does this patient have obstructive sleep apnea?: The Rational Clinical Examination systematic review. JAMA 2013;310(7):731-41.

17. Rodrigues MM, Dibbern RS, Goulart CW. Nasal obstruction and high Mallampati score as risk factors for obstructive sleep apnea. Brazil J Otorhinolaryngol 2010;76(5):596-9.