Original Research Article

Study on distribution of different classes of Mallampati grading and its association with sleep apnea - a cross-sectional analysis

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Abstract

Background: Clinical assessment of structural narrowing of oropharynx may help in early detection of obstructive sleep apnoea (OSA). The Modified Mallampati Classification can predict the higher incidence of sleep apnea based on the morphology of oropharynx. To substantiate this Epworth Sleepiness scale is used to measure daytime sleepiness or average sleep propensity in daily life (ASP). We aim to identify the type of oropharyngeal pattern and its association with sleep apnoea which may be reflected by daytime sleepiness using simple tests. **Aim:** To estimate the distribution and common type of mouth opening pattern as per Modified Mallampati classification and to correlate the type of Mallampati pattern with ASP or daytime sleepiness using the Epworth Sleepiness Scale (ESS). **Materials and Methods:** Sample size of 100 subjects of age 18 to 60 years were chosen from outpatient department and master health check-up. By physical examination of mouth opening, the score under Mallampati classification were noted and all subjects were asked to fill up Epworth scoring scale questionnaire. Common type of mouth opening and its relation to ESS scores were evaluated. The collected data was analyzed using SPSS software. **Results:** Mallampati grading were 15% class-1, 39% class-2, 35% class-3, and 11% class-4 among the study population. Significant association between Modified Mallampati scoring (MMS) with Epworth Sleepiness scale (ESS), 26% of the subjects reported increased day time sleepiness, in which 10% were under class 3 and 4,the reason might be due to anatomical overcrowding of oropharynx and the remaining 16% were under Class-1 and 2. **Conclusion**: Presence of high Modified Mallampati score is strongly associated with high prevalence of daytime sleepiness. There is more prevalence of narrowed airway pattern as evidenced by high Modified Mallampati score and is associated with more risk of daytime sleepiness.

Keywords: Epworth Sleepiness Scale, Modified Mallampatti Scoring , sleep apnoea

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Introduction

Structural narrowing of the upper airway, a main risk factor for pharyngeal occlusion during sleep in obstructive sleep apnoea-hypoponea syndrome (OSAS).[1] With prevalence of 4% in adults and epidemiological data stating highest cardiovascular morbidity in patients with OSAS necessitates the potential importance of its early recognition.[2-4] OSAS, a clinical syndrome characterised by recurrent upper airway obstruction leading to hypoventilation (hypopnoea) or apnoea, always accompanied by loud snoring and arousals during sleep as evidenced by polysomnography.[5] Patients are unaware of these arousals and mostly presents as excessive daytime sleepiness (EDS). Apnoea during sleep is an important clue that requires a periodic continual observation.

Recently, anatomical deficits in upper airway found to be involved in the pathogenesis of OSA.[6]

An anaesthetist's instrument as well as a simple, noninvasive airway-classification system is the Mallampati score, used to assess intubation risk based on the oropharynx morphology and has been suggested as an assessment tool for OSA. Studies have reported associations between Mallampati score and OSA.[7-14] Studies recently stated the link between nasal obstruction, sleep-disordered breathing (SDB) and increased frequency of OSAS.[15-18] Epworth Sleepiness Scale (ESS) introduced by Dr Murray Johns in 1991, is a validated scale primarily for diagnosis of OSAS, narcolepsy and idiopathic hypersomnia with high specificity and sensitivity intended to measure excessive daytime sleepiness by a short questionnaire.[19,20] As the frequent symptoms like snoring and daytime sleepiness lack specificity for diagnosis, we intend to use Modified Mallampati Score (MMS) by Samsoon and Young and ESS in our study.[21]

Attempts made to diagnose it based on history, physical examination and oximetry were unsuccessful, might be due to the limited diagnostic facilities and non-specific symptoms, that keeps OSAS remain undiagnosed.[22,23] More than 80% of patients with OSA remain untreated.[24,25] A test to rule out OSA based on a simple clinical feature without use of polysomnography or any advanced tests is highly desirable.

We therefore sought to clinically assess oropharynx and find out its association with daytime sleepiness; both might predict the presence of OSAS. In this study, we aim to estimate the distribution and common type of mouth opening pattern as per Mallampati classification and to correlate the type of Mallampati pattern with the prevalence of excessive daytime sleepiness using Epworth sleepiness scale.

Materials and Methods

This cross-sectional study was started after obtaining institutional ethics clearance and written informed consent from subjects, and was conducted at the department of ENT, Stanley Medical College, Chennai.

Inclusion and Exclusion criteria: A statistically adjusted sample size of 100 clinically healthy individuals of age 18 to 60 years were chosen from outpatient department of ENT and master health check-up. Subjects with any chronic metabolic or neurological disorders, any endocrinological illness, surgical illness or recent upper respiratory tract infection or dental caries past 3 months, those who have congenital musculoskeletal disorders or with enlarged nodes in neck, those who are under chronic medications and high BMIs were excluded from the study.

Procedure: After clear instructions, the study was performed by asking the subjects to sit with his/her head in neutral position. Anatomy of oral cavity was visualized, physical examination and Modified Mallampati classification was noted which was confirmed by two Otolaryngologist. Modified Mallampati score (MMS) assessed by asking subjects to breath hold after normal inspiration with mouth wide opened and tongue protruding to maximum without phonation or any attempted elevation of soft palate. Inspection of oropharynx done at the eye level and the class was assigned based on close similarity to a standard chart. No tongue depressor was used as it may give false positive value. All the subjects were then asked to fill up the Epworth scoring scale questionnaire and a self-made questionnaire consisting of socio-demographic details.

Statistical Analysis: The data were collected and analyzed using SPSS software. Chi-square test and Spearman correlation was used to evaluate the Mallampati score and Epsworth sleepiness scale among the study population.

Results

In our study, 100 clinically healthy individuals were evaluated for assessment of daytime sleepiness and the upper airway/mouth opening pattern using Epworth sleepiness scale and Modified Mallampati grading.

The mean and SD for MMS score in males (n=50) and females (n=50) were 2.59±0.897 and 2.27±0.863 respectively. No significant gender differences were observed for both MMS and ESS scoring. The mean and Standard Deviation (SD) of ESS vs MMS scoring were depicted in Table 1.

Table 1: Mean and SD of ESS vs MMS scoring among the study population

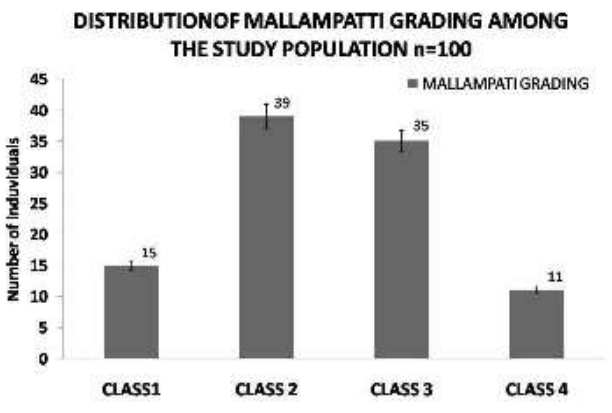
Variables	Mean	SD	95% CI	Sig.
ESS vs MMS class-1	8.94	3.473	7.09-10.79	0.02*
ESS vs MMS class-2	7.16	3.106	6.14-8.18	0.04*
ESS vs MMS class-3	6.89	2.87	5.92-7.87	0.019*
ESS vs MMS class-4	7.45	2.29	5.91-9.0	0.001*

*p<0.05 considered significant; Chi square test was used.

I. Distribution of Modified Mallampatti Grading among the study population

We found that the distribution of the Mallampati grading were Class-2 (39%), Class-3 (35%) and rest Class-1 (15%) and Class-4 (11%) among the study population as depicted in Figure 1. The most common mouth opening pattern is class-2 of Modified Mallampatti grading in our study. No significant gender differences observed. High MMS score was observed in 46% of apparently normal healthy subjects who were under class-3 and class-4.

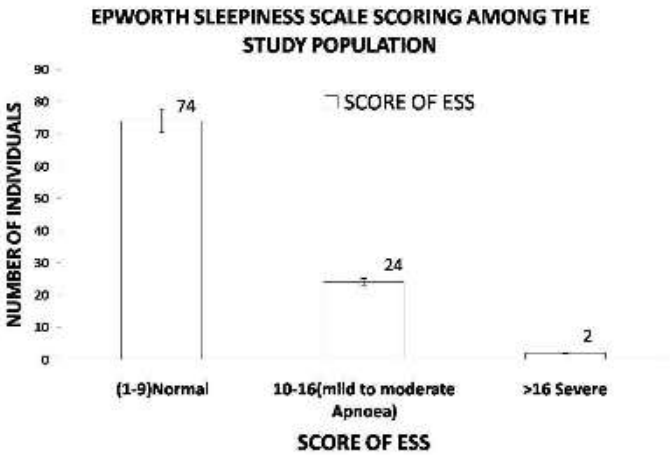
Figure 1: Distribution of Modified Mallampatti Grading among study population



II. Prevalence of Daytime sleepiness using Epworth Sleepiness Scale among the study population

When assessed for the prevalence of daytime sleepiness in normal healthy subjects, 24 subjects were reported to have mild to moderate risk of sleep apnoea whereas 2 subjects were showing score for severe apnoea as depicted in Figure 2.

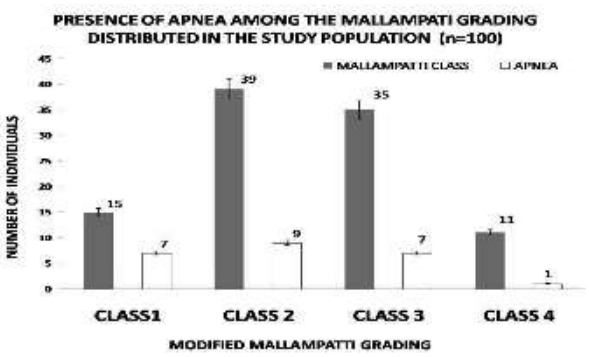
Figure 2: Prevalence of Excessive Daytime sleepiness among study population



III. Prevalence of apnoea among the distributed Mallampati grading in study population

By associating Modified Mallampati scoring (MMS) with Epworth Sleepiness scale (ESS) as depicted in Fig.3. We observed that within each Mallampatti grading a proportion of subjects were found to have apnoea, significantly higher with Class 3 and Class 4. In which 26% showed significant possibility of apnea and among them 10% subjects were categorized to come under class 3 and 4. This implies their airways were evidenced to be narrowed which is reflected in the ESS scoring.

Figure 3: Prevalence of apnoea among the distributed Mallampati grading a study population



A significant positive correlation (rho= 0.71, p<0.004) was found between Modified Mallampati scoring (MMS) and Epworth Sleepiness scale (ESS) score among the study population.

Discussion

Modified mallampati classification-a good predictor of difficult tracheal intubation and sleep apnea.[26] Epworth sleepiness scale is to measure daytime sleepiness and the sleep quality. Ours a preliminary study to provide data on the common distribution pattern of oropharyngeal anatomy using Modified Mallampatti grading and the existing prevalence of daytime sleepiness among the general population. Inter-observer reliability and reproducibility is good with the use of MMS classification, even in senior clinicians.[27] The influence of the high Mallampati score on sleep apnoea and sleep respiratory disorders has been described in numerous studies.[15,16]

Studies reported symptoms of OSA in the non-apneic patients who had 35% apnea and 68% daytime sleepiness and showed 54% specificity in detecting an apnea-hypopnea index (AHI).[28] In a cohort study of patients undergoing anesthesia a positive correlation between more oropharyngeal crowding (higher Mallampati class) with OSA and difficult intubation.[29] A significant high correlation between Modified Mallampati class and AHI was also reported in a study.[30] Same institution also reported the higher degrees of oropharyngeal crowding , clinical utility of MMS and its negative correlation with AHI in patients after nasal surgery.[31] Similarly another cohort study has stated that 62% nasal obstruction associated with higher Mallampati class.[32] In a prospective study assessed OSA in people attending sleep clinic and diagnosed OSA with Mallampati class.[33]

From our study population we prove that the most common oropharyngeal anatomy based on MMS is class-2. Surprisingly 46 % (number of individuals in both class-3 and class-4) of clinically healthy individuals showed a higher modified Mallampatti scoring, of which 11% showed a class-4 score. Inspite of having a high MMS, they did not report any breathing difficulty though few (50%) of them reported as having snoring problem during sleep.

Our study also states that 26% of subjects tend to have a definite possibility of apnea, reason might be due to anatomical overcrowding of oropharynx and increased daytime sleepiness and should be investigated further. The strength of our study is that when we found few subjects with apnoea were under MMS Class-2 and 1 assessed to have frequent daytime sleepiness and they should be ruled out for any systemic abnormalities. Certain questions in ESS 'like falling asleep few minutes in traffic', for which 8% had answered 'yes' which signifies a serious threat of sleep disorder and has to be given importance clinically. Rates of traffic accidents were two to three times higher in individuals with sleep apnoea compared to general population in west. A significant positive association between the Mallampati score with daytime sleepiness increases the likelihood of developing apnea. Those 16 healthy subjects who had normal mouth opening pattern but showed a high ESS scores, the cause might be due to night shift work, alcohol/smoking or any systemic illness like obesity (High BMI), sinusitis, hypertension, hypothyroidism and coronary artery disease, which needs to be evaluated in detail.

We emphasize that simple elements such as the determination of Mallampati score and the estimation of daytime sleepiness can be useful to suspect obstructive sleep apnoea in outpatient clinic. Conversely, the association of a high Mallampati score and excessive daytime sleepiness from our study might help us in our further studies to evaluate OSA.

Limitations of the study: We need to include a larger sample size to find out the test statistics of the same tests; the non-representativeness of the study population is a possible limitation. Also a detailed evaluation of sleep apnoea using polysomnography and fMRI is needed.

Conclusion

Presence of high Modified Mallampati score is strongly associated with high prevalence of daytime sleepiness. Those who had normal Mallampatti scoring but showed a significant prevalence of daytime sleepiness might represent a subclinical population whom physicians are missing to rule out the presence of sleep apnoea. Though a detailed evaluation is mandatory to diagnose the sleep disorders of breathing we propose to use the scoring scales from our study as screening test for early detection of subclinical apnea. We are intending to extend this work on to a larger population.

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Conflicts of interest: Nil

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