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To Compare Airway Indices and Incidence of Difficult Intubation in Snorers and Non-Snorers

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ABSTRACT
The aim of the study was to evaluate the relationship between different airway indices and history of snoring in patients under general anesthesia with prediction of difficulty in tracheal intubation. 145 patients aged 16-60 years of either sex, ASA I/II who presented for elective surgical procedures requiring general anesthesia with endotracheal intubation were included in the study. Preanesthetic check up with history of snoring and measurement of airway indices was done by an experienced anesthesiologist. After induction of anesthesia laryngoscopy was done and the CL Grading, IDS, duration of laryngoscopy, number of attempts, change of blade, number of operators was noted by a single experienced anesthesiologist who was unaware of the intervention. The incidence of snoring increased significantly with age and a female predominance was seen. Higher ASA grade, increased BMI, decreased TMD, SMD was less among snorers than non snorers which was statistically highly significant with increased risk for difficult intubation. Neck circumference was identified as an independent predictor for difficult intubation in snorers. Increase in the Neck circumference increased the Difficult intubation (DI) by 0.036 units. Higher grades of CL grade was associated with difficult intubation and identified as an independent predictor for difficult intubation. Snoring had an association with age, female gender, BMI and ASA grade. Snorers had a larger neck circumference, smaller thyromental and mandibulohyoid distance as compared to non-snorers. This prediction of difficult airway may lead to a better anticipation of difficult airway management.

INTRODUCTION

A difficult airway (DA) defined as "the clinical situation in which a conventionally trained anesthesiologist experiences difficulty with face mask ventilation of the upper airway, difficulty with tracheal intubation or both"[1]. The important adverse outcomes include but are not limited to death, unnecessary surgical airway, airway trauma, brain injury, cardiopulmonary arrest and damage to the teeth. Difficult intubation (DI) is one of the major causes of morbidity and mortality, so it is essential for the anestheologists to evaluate risk factor in every surgical patient. Prevalence of snoring is being increased and patients with snoring pose a potential threat for securing an airway because of reduced space between the pharyngeal wall posteriorly and the base of the tongue and alterations in craniofacial structure hence more prone to collapse[2]. Collapsiblility of pharyngeal airway are more in snorer than non snorers. The size of upper airway is decreased and collapsibility is increased at the velopharyngeal level in snorers as compared to nonsnorers[3]. A detailed history, physical examination begins with an assessment of difficult airway in patients. An anesthesia associated mortality can be reduced by early and proper airway assessment, identifying the risk factor which were associated with difficult airway and appropriate measure to handle both the unanticipated and anticipated difficult airway[4]. There is no single predictor but multiple predictors when taken in toto can identify difficult airway with more certainty[5]. Patients with history of snoring have higher neck circumference (NC) higher body mass index (BMI) and higher Modified Mallampati Grading (MMPG) class III-IV[2]. An association between older, heavier patients and difficult laryngoscopy (DL) can be demonstrated [6]. The modified Mallampati grade Class 3 and 4 are attributed to prediction of difficult airway and intubation. Thyromental distance (TMD) with a distance of $\leq$6.5 cm and sternomental distance (SMD) with a distance of $\leq$12.5 cm being associated with difficult intubation. The size of tongue is evaluated in comparison to oral cavity and this phenomenon help prediction of difficult airway. This study evaluates the relationship between different airway indices and history of snoring in patients under general anesthesia (GA) with difficulty of tracheal intubation.

MATERIALS AND METHODS

The present study was conducted in the Department of Anaesthesiology, in a tertiary care center over the period of 12 months after approval from institutional ethical committee (SRHU/reg/int/2018-319). 145 patients aged 16-60 years of either sex, ASA I/II who presented for elective surgical procedures requiring general anesthesia with endotracheal intubation. History of snoring was obtained and patients were divided into 2 groups. Patients with external neck deformity/malformation of neck or face, STOP BANG score $\geq$3, reactive airway disease (COPD, Asthma) unstable/curved spine deformity, history of gastroesophageal reflux disease, pregnancy/oropharyngeal mass/neck surgery. Patients not willing to participate in study was excluded. Patients were explained in detail about the anaesthetic technique during pre-anaesthetic evaluation demographic data, history of snoring, airway indices measurement noted and a written and informed consent was taken. Patients was kept nil per oral (NPO) 6 hours prior to surgery and was monitored for noninvasive blood pressure, heart rate, ECG and oxygen saturation. The anesthetic technique remained standardized for all patients. The initial direct laryngoscopy was performed in all cases with use of a Macintosh number 3-laryngoscope blade for the sake of consistency of the technique. All the intubations were performed by single experienced anesthesiologist who was unaware about the intervention. Cormack and Lehane grading was recorded using Cormack and Lehane grading scale The following data was recorded-number of attempts/number of operator attempting intubation, number of alternative techniques used, change of blade or tube, addition of a stylet or bougies, duration of laryngoscopy

The sample size for the study is calculated by the formula

- $n = Z2/2\alpha p(1-p)\ L^{-2}$
- where α is the level of significance (5%)
- l is the relative error(15%)
- p is the prevalence of snorers(40%)
- Calculated sample size is 145

Statistical analysis: Statistical testing was conducted with the statistical package for the social science system version SPSS 22.0. Continuous variables were presented as mean±SD and categorical variables was presented as absolute numbers and percentage. The comparison of normally distributed continuous variables between the groups was performed using Student's t-test. Nominal categorical data between the groups was compared using Chi-squared test or Fisher's exact test as appropriate. The $p\leq0.05$ was considered significant and $p\leq0.001$ was considered as highly significant.

RESULTS

A total of 145 patients completed this study. There was statistically significant difference between the two groups regarding the age, height, weight, sex and duration of operation. Majority of subjects in the study was non snorers 79 (54.48%) while snorers was 66 (45.52%) out of which 67 are males (40.91%) and 78 are females (59.09%) (Table 1).

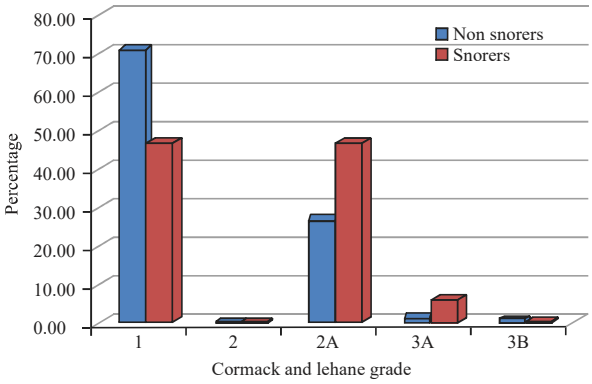

Fig. 1: Grading of Cormack Lehane grade among 2 groups in the study population

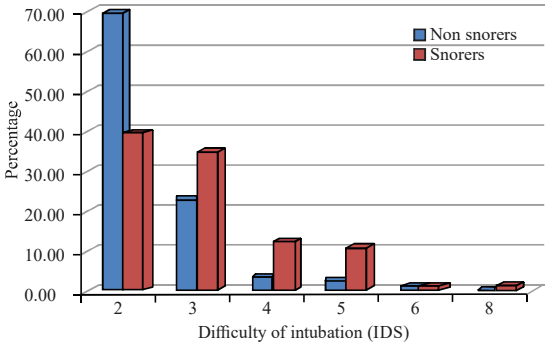

Fig. 2: Intubation difficulty scale scoring Comparison in 2 groups of study population

There was high ASA grade among snorers than non snorers which was statistically highly significant (p<0.001). Mean weight among subjects with snoring was 76.30±12.91 kg and 58.62±8.23 kg in non snorers. The mean BMI of snorers was 33.09 kg m^{-2} while that of non-snorers was 24.86 kg m^{-2} . This was statistically highly significant (p<0.001). The mean age group amongst non-snorers was 38.37±10.84 years and 44.39±10.15 years was statistically highly significant (p<0.001).(Table.2). The mean TMD measures in snorers was 4.57±1.01 cm and 6.74±0.95 cm in non snorers which was statistically highly significant (p<0.001). Mean MHD of 6.87±2.0 cm in subjects with snoring and 8.11±1.63 cm among non-snorers which was highly significant (p<0.001). The mean neck circumference of snorers was 40.77 cm while in non-snorers it was 34.46 cm which was statistically highly significant (p<0.001). Mean MPG among subjects with snoring was 1.94±0.46 and 1.75±0.52 in non snorers. In CL grading 31 (46.97%) snorers and 56 (70.89%) non snorers had grade I CL, 21 (26.58%) snorers and 31 (46.97%) non snorers had grade 2A, 4 (6.06%) snorers and 1 (1.27%) non snorer had grade 3A while only 1 (1.27%) non snorer had grade 3B CL. grading I and 2A was highly significant (p<0.05) (Fig. 1).

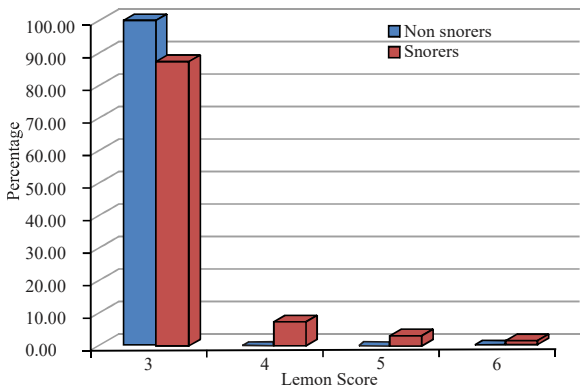

Fig. 3: Comparison of modified lemon Score among 2 groups of study populatio

Table 1: Comparison of incidence of snoring in both gender in 2 groups

	Non-Snorers		Snorers		
Gender	No	percentage	No	percentage	p-value
Male	40	50.63	27	40.91	0.121
Female	39	49.37	39	59.09	
Total	79	100	66	100	

Chi-square/ Fisher's exact test

The mean IDS was 2.42±0.8 in non-snorers and 3.06±1.21 with a P-value which is highly significant in snorers as compared to non-snorers. The mean LEMON score (Look externally-facial trauma-1, large incisor-1, beard or moustache-1, large tongue-1[2] (Fig. 3) Evaluate 3-3-2 rule-inter-incisor distance ≤3 finger breaths, hyoid to mental distance ≤3 finger breaths, thyroid to hyoid distance ≤2 finger breaths[3]. obstruction to airway[4]. Neck mobility-limited or applying neck immobilizer total score-9 was 3.00±0 in non-snorers and 3.18±0.55 with a p-value which is highly significant in snorers as compared to non-snorers. Attempts taken for intubation among 77 (97.47%) non-snorers was intubated in a single attempt whereas 58 (87.88%) snorers was intubated in single attempt. 2nd attempt for intubation was taken in 2 (2.53%) non snorer patients and 8 (12.12%) snorers which was significant (p>0.012) (Fig. 4). Number of operators attempting intubation all 79 (100.00%) non-snorers patient was intubated by a single operator whereas 3 operators attempted intubation in 1 (1.52%) snorer. The addition of stylet/bougies was 6 (7.59%) among non-snorers and 16 (24.24%) with a p-value 0.003 which was higher in snorers than non-snorers (Fig. 5). Change of blade was done in 1 (1.52%) snorer only which was statistically not significant. The mean Duration of Laryngoscopy in sec was 12.33±10.5 in snorers and 8.44±2.38 in non-snorers which was statistically highly significant (p<0.001). The total mean intubation duration in HR was 1.94±1.12 in subjects with snoring and 1.83±1.11 in non-snoring subjects.

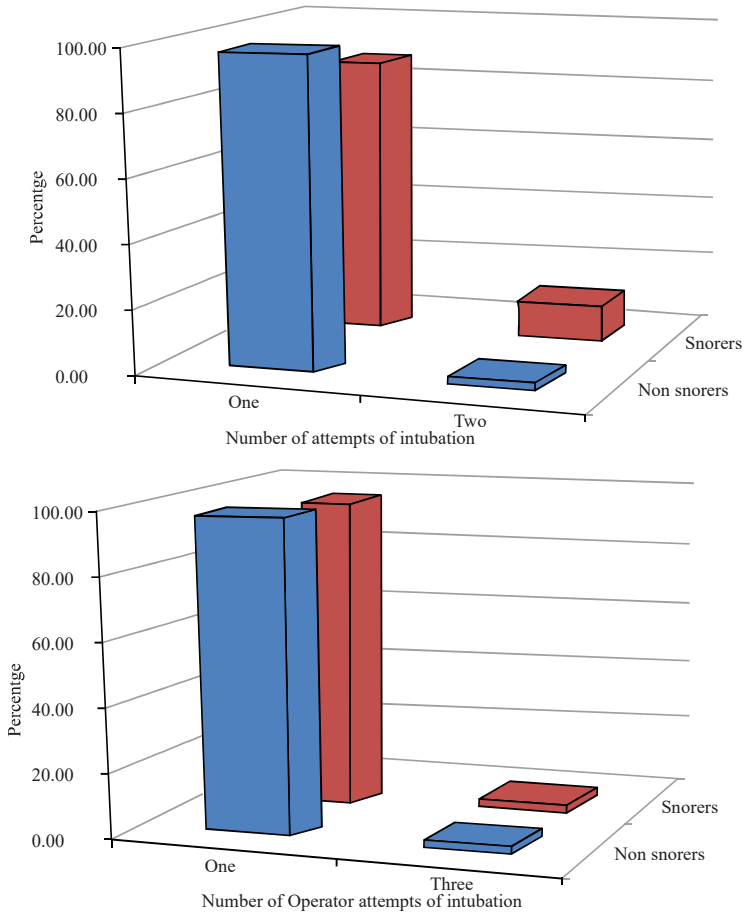

Fig. 4: Attempts taken and Number of operators attempting intubation among the 2 groups of study population

Table 2: Comparison of Different Airway Indices and Demographic characteristics among 2 groups of study population

	Non Snorers		Snorers		
	Mean	±SD	Mean	±SD	p-value
Thyromental distance	6.74	±0.95	4.57	±1.01	<0.001
Sternomental distance	15.28	±2.25	14.86	±3.09	0.173
Mandibulo-hyoid distance	8.11	±1.63	6.87	±2.32	<0.001
Inter incisor distance					
Neck circumference (cm)	4.27	±0.52	4.15	±0.49	0.088
Age (years)	34.46	±2.16	40.77	±3.97	<0.001
Weight (kg)	38.37	±10.84	44.39	±10.15	<0.001
Height (cm)	58.62	±8.23	76.30	±12.91	<0.001
BMI (kg/m^2)	153.44	±6.81	151.64	±8.16	0.074
	24.86	±3.25	33.09	±6.4	<0.001

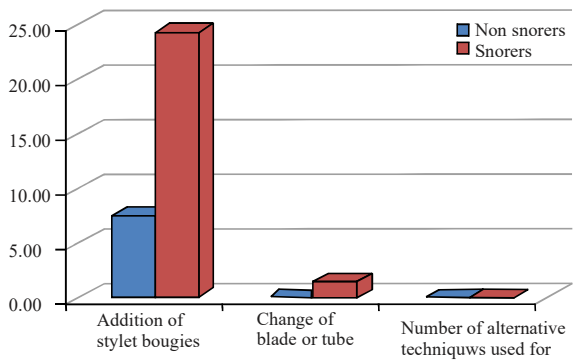

Fig. 5: Comparison of various parameters in both the groups

DISCUSSION

Majority of subjects in the study were non snorers 79 (54.48%) while snorers were 66 (45.52%) out of which 67 were males and 78 were females. A female predominance of snoring is seen. This is in contrast to various studies who have concluded that the incidence of snoring is high amongst males.

Adewole *et al.*[7] also concluded that female predominance of snoring in the age group of 40-49 years is more (34%) as compared to male. The mean age group amongst non-snorers was 38.37±10.84 yrs and 44.39± 10.15 yrs amongst snorers which was highly significant. The incidence of snoring increased with age. Mean ASA among non-snorers was 1.24±0.43 and snorers was 1.50±0.5 (<0.001). Prakash *et al.*[8] also

concluded from the study that there was a correlation between diabetes and difficult laryngoscopy and on univariate analysis hypertension was associated with DL Mean weight among subject with snoring was 76.30±12.91 kg and 58.62±8.23 kg in non-snorers was highly significant. The mean BMI of snorers was 33.09 kg m^{-2} while that of non-snorers was 24.86 kg m^{-2}. BMI > 26 kg m^{-2} were described as an independent risk factor for DI in study of Prerna *et al.* [9] in a multivariate analysis Sandeep G also observed that association of incidence of snoring increased with higher BMI and snoring increases the risk for difficult intubation. Shiga in their study found that obese patient had incidence of difficult intubation three times more as compared to normal patients. The mean TMD measure in snorers was 4.57±1.01 cm and 6.74±0.95 cm in non-snorers which was statistically highly significant. Prakash *et al.*[3] also associated decreased TMD with difficulty in laryngoscopy. The sternomental distance for snorers was 14.86±3.09cm and in non-snorers 15.28±2.25 cm. The study by Prakash *et al.*[5] showed that using cut-off point of 12.5 cm and 13.5 cm of SMD to predict difficult laryngoscopy. The SMD difference in the group of easy and difficult laryngoscopy groups (14.6±1.7 cm and 13.8±2.1 cm, respectively) which was statistically significant The mean MHD distance was of 6.87±2.cm in subjects with snoring and 8.11±1.63cm amo In study of Chhina *et al.* the Neck circumference had a sensitivity of 88.5% which was in accordance to the observations by Gonzalez *et al.*[10] the study by Rao, *et al.* predicting difficult laryngoscopy/intubation by using NC as parameter is dependent on the BMI of the population[10]. A study by Vasudevan A they concluded that odds ratio with decreased mento hyoid distance as compared to normal MHD was 3.4 times probability of DI. The mean neck circumference of snorers was 40.77 cm while in non-snorers it was 34.46 cm which was highly significant. Sandeep *et al.*[12] among various measurements of airway neck circumference was larger in snorer than non-snorer which was significant. Brodsky *et al.*[8] found in logistic regression that measuring the neck circumference is the best single predictor of problematic intubation which is concurrent with our study Limitations-We did not predict the best parameter amongst LEMON Score and IDS to predict the DI.

CONCLUSION

Multivariate analysis identified neck circumference, CL grade 2 and CL grade 3 as best set of predictors of difficult intubation in snorers. The best predictors for DI were identified as CL grades 2 and 3 and neck circumference. In comparison to CL Grade, the DI will increase by 1.266 units for CL Grade2 . In comparison to CL Grade, the DI will increase by 2.790 units for CL Grade3. A unit increase in the Neck circumference will increase the DI by 0.036 units.

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