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Original Research Article

Ratio of Patient's Height to Sternomental Distance in Assessing Difficult Laryngoscopy among Adults Scheduled for Elective Surgery

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ABSTRACT:

Background: Failure to assess and predict difficulty in airway management can contribute to poor outcomes in anesthesiology practice. The existing parameters are far from perfect. Ratio of height to sternomental distance as a tool to predict difficult laryngoscopy requires further validation

Methods: This was a hospital based prospective observational study conducted among 300 adult patients undergoing general anaesthesia for elective surgery. Modified Mallampati test (MMT), Upper lip bite test (ULBT), sternomental distance (SMD) and ratio of height to sternomental distance (RHSMD) were assessed preoperatively. Difficulty in laryngoscopy was assessed using Cormack -Lehane grading. The sensitivity, specificity, predictive values and accuracy of each test for predicting difficult laryngoscopy (i.e., CL grade III and IV) were compared. The best cut off of RHSMD was determined by receiver operating characteristic curve (ROC) analysis. This was done in the Department of Anaesthesiology, Government T.D. Medical College, Alappuzha from January 2019 to June 2021 after obtaining Institutional Ethics Committee approval.

Results: The incidence of difficult laryngoscopy was 8.7%. There were no difficult intubations. RHSMD was independent of age and gender. The area under the ROC curve for RHSMD was 0.89 (95% confidence interval 0.83-0.96). The best cut-off was 11.9. RHSMD>11.9 (OR=19.5), ULBT class 3 (OR=15.5) and MMT class above 2 (OR=9.2) were independently associated with difficult laryngoscopy. The sensitivity and the specificity of predicting difficult laryngoscopy were 65.4% & 86.9% for MMT, 15.4% & 99.6% for ULBT, 42.3% & 93.8% for SMD at cut off of 12.5cm, 73.08% & 92.3% for RHSMD at cut off of 11.9 and 92.3% & 81.39% for combination of MMT, ULBT and RHSMD.

Conclusion: RHSMD is an accurate tool for predicting difficult laryngoscopy. It is a better screening test for difficult laryngoscopy compared to ULBT, MMT and SMD. However, a combination of multiple tests is recommended to improve the accuracy of the prediction of difficult laryngoscopy.

Keywords: Airway Assessment, Difficult Airway, Difficult Laryngoscopy, RHSMD (Ratio of Height to Sternomental Distance).

INTRODUCTION

An important responsibility of an anaesthesiologist is to provide a secure airway in anaesthetized patients. The reported incidence of difficult laryngoscopy and intubation is 1.5%-13% [1-4] and the incidence of 'cannot intubate and cannot ventilate' is 0.0001%-0.02%.[5,6] In patients undergoing general anaesthesia, failure to secure the airway is the major cause of morbidity and mortality. The vast majority of airway-related events result in cerebral damage. The difficult airway can manifest as difficult mask ventilation, difficult laryngoscopy or difficult intubation. In most patients, difficulty in laryngoscopy is considered equal to difficulty in intubation.[7] Manipulation of the airway by multiple attempts during direct laryngoscopy often leads to trauma, bleeding, and oedema, ultimately resulting in poor vocal cord visualization and difficult intubation.

Preoperative assessment of the airway is thus one of the fundamental steps in anaesthesia. Many preoperative airway assessment tests like inter-incisor gap, adequacy of mouth opening, modified Mallampati classification, upper lip bite test,

sternomental distance and thyromental distance are widely used to predict difficult intubation. However, the sensitivity and positive predictive values of these tests are low whereas false positive rates are high. None of these tests can reliably exclude difficult intubation. The ratio of height to sternomental distance (RHSMD) is a relatively new parameter added to this list. In the study conducted by Dr Farnoush Farzi [8], it was observed that the ratio of height to sternomental distance, considering its high sensitivity, specificity and odds ratio, could be used as a valuable screening test in predicting difficult airways. The few other available studies also supported this conclusion but each study obtained different cut-offs.[9,10]

Not many studies have come up in the Indian population in assessing this parameter as a predictor for difficult laryngoscopy. Hence it is imperative to conduct a study to assess the accuracy of this parameter and to find out the optimal cut-off to predict difficult airways.

This prospective observational study aimed to validate the 'ratio of height to sternomental distance' in assessing difficult laryngoscopy and compare its performance with other preanaesthetic assessment tools such as the Modified Mallampati test, upper lip bite test and sternomental distance.

AIMS AND OBJECTIVES

Primary Objective

To assess the validity of RHSMD (Ratio of height to sternomental distance) as a parameter for predicting difficult laryngoscopy among patients scheduled for elective surgery under general anaesthesia in Government T.D. Medical College, Alappuzha.

Secondary Objective

To compare ULBT (Upper lip bite test) and MMT (Modified Mallampati test) with RHSMD for predicting difficult laryngoscopy among patients undergoing surgery under general anaesthesia in Government T.D. Medical College, Alappuzha.

MATERIALS AND METHODS

This was a hospital based prospective observational study conducted among 300 adult patients undergoing general anaesthesia for elective surgery who were preoperatively assessed using the Modified Mallampati test (MMT), Upper lip bite test (ULBT), sternomental distance (SMD) and Ratio of height to sternomental distance (RHSMD). The sensitivity, specificity, predictive values and accuracy of the tests for predicting difficult laryngoscopy (i.e., CL grade III and IV) were compared. This study was done in the Department of Anaesthesiology, Government T.D. Medical College, Alappuzha from January 2019 to June 2021 after obtaining Institutional Ethics Committee approval.

(EC No: 03/2020 IEC Reg No ECR /122 /Inst /KL/ 2013/RR-19)

Inclusion Criteria

Adult patients in the 18 to 60-year age group with American Society of Anaesthesiologists (ASA) physical status 1 and 2 scheduled for elective surgery under general anaesthesia with endotracheal intubation who were willing to participate in the study.

Exclusion Criteria

Patients with mouth opening less than 3cm, unable to sit or stand, midline neck swelling where anatomy is distorted, cervical spine pathology, developmental abnormalities which may affect airway assessment, edentulous patients, and patients who needed rapid sequence intubation.

Sample Size

The study conducted by Dr Farnoush Farzi[8] comparing common upper airway tests for predicting difficult laryngoscopy in elective surgical patients showed a sensitivity of RHSMD as 73%. The total number of difficult airway cases obtained for the present study was calculated using the formula $4pq \div (d^2 \text{ x prevalence})$ i.e., $4 \times \text{sensitivity} \times (100\text{-sensitivity}) \div (d^2 \text{ x prevalence})$, here p is 73% and q is 27% and d is an allowable error which is taken as 15%.

$$= (4 \times 73 \times 27) \div (15 \times 15) = 35$$

Assuming a prevalence of 12% [8], 290 cases were sufficient. So, the sample size was taken as 300.

Methods of Data Collection

Data was collected from 300 adult patients in the 18 to 60-year age group of American Society of Anaesthesiologists (ASA) physical status 1 and 2 scheduled for elective surgery under general anaesthesia. After obtaining informed consent and confirming adequate NPO status, they were assessed in the preanaesthetic check-up room using a modified Mallampati test, upper lip bite test, sternomental distance (distance from the upper border of the suprasternal notch to mentum with the head fully extended), height and ratio of height to sternomental distance by the principal investigator. Modified Mallampati test class III and IV, upper lip bite test - III, a sternomental distance less than 12.5 cm and the ratio of height to sternomental distance more than or equal to 12.5 were considered predictors of difficult laryngoscopy. Then the patient was shifted to the operation theatre. An emergency airway cart which contains a McCoy laryngoscope, bougie, stylet, laryngoscope blade of

different sizes, laryngeal mask airway of appropriate size, and endotracheal tube of different sizes was kept ready in the operation theatre. After ensuring an 18G intravenous cannula, monitors like pulse oximeter, electrocardiogram, non-invasive blood pressure, and end-tidal carbon dioxide monitors and additional monitors as required for each case were used for each patient. All patients were premedicated with intravenous Inj. Midazolam 1 mg, Inj. Glycopyrrolate 0.2 mg, Inj. Fentanyl 1.5 mcg/kg. All the patients were induced with Inj. Propofol 2mg/kg after priming with Vecuronium. If adequate bag and mask ventilation were possible, then Inj. Vecuronium 0.1 mg/kg was given and was ventilated with 100% oxygen. After placing the head in the intubating position, laryngoscopy was performed with a Macintosh No.3 blade for females and No.4 blade for males by an experienced anaesthesiologist who had more than 5 years of experience after acquiring post-graduate qualification. The view was graded into I, II, III and IV according to Cormack -Lehane classification (CL).

The anaesthesiologist who documented the laryngeal view by the Cormack-Lehane classification was blinded to preoperative airway assessment to minimize observer bias. Cormack-Lehane grades III and IV were considered difficult laryngoscopy. After assessing the Cormack-Lehane classification, all patients were intubated with a proper-sized endotracheal tube.

Statistical Methods

Data were entered in Microsoft Excel. Statistical analysis was done using SPSS software version 23.0 (SPSS, Inc., Chicago, IL, USA). Quantitative variables were expressed in mean (with standard deviation). Qualitative variables were expressed in proportion. Student t-test (parametric) and Mann-Whitney U test (nonparametric) were used to compare continuous variables. The chi-square test and Fisher Exact tests were used to compare categorical variables. Variables with a significant association in the univariate analysis were subjected to binary logistic regression analysis to identify independent associations. Statistical significance in the study was predetermined as $p<0.05$. The performance of RHSMD was assessed by receiver operating characteristic curve (ROC) analysis using the area under the curve. Statistical significance of the test characteristics (sensitivity, specificity, positive and negative predictive values, accuracy and likelihood ratios) of each test were compared using epidemiological software, open epi info version 3.03a.

RESULTS

1. Mean SMD and RHSMD of the study population

The mean sternomental distance (SMD) was 14.39±1.35 cm. The lowest SMD was 10cm and the highest 18cm.

The mean Ratio of height to sternomental distance (RHSMD) was 11.08 ± 0.78, the lowest was 9.44 cm and the highest 14cm. 286 (95.3%) patients had RHSMD ≤ 12.5 while 14 (4.7%) had RHSMD > 12.5.

2. Association of RHSMD with gender and age

There was no statistically significant difference in average values of RHSMD between males and females (p=0.68). No significant difference in the average values of RHSMD in different age groups (p=0.36) noted.

3. Comparison of upper lip bite test and Cormack - Lehane grade

Out of 26 study subjects with difficult laryngoscopy (CL grade III/IV glottic exposure) 4(15.4%) were classified correctly by upper lip bite test (Class III). The odds ratio of having CL grade III or IV in ULBT class III was 17.7(95% confidence limit 2.8-110.6), p=0.005.

4. Comparison of modified Mallampati class and Cormack - Lehane grade

Out of 26 study subjects with difficult laryngoscopy (CL grade III/IV glottic exposure), 17(65.4%) were classified correctly by modified Mallampati classification (Class III & IV). The odds ratio of having CL grade III or IV in MMT class III or IV was 12.5(95% confidence limit 5.2-30.1), p<0.001

5. Comparison of SMD and Cormack - Lehane grade

Mean SMD was 14.5cm for CL 1&II and 12.8cm for CL III&IV (p<0.001).

Table 1: Relation of RHSMD with Gender and Age

	Total (n=300)	Gender		Age group		
		Male (n=125)	Female (n=175)	Age<30 (n=55)	Age 30-50 (n=161)	Age >50 (n=84)
Mean	11.08	11.11	11.07	10.97	11.10	11.16
SD	0.78	0.82	0.73	0.68	0.81	0.79
Median	11	11.03	10.94	10.97	11	10.985
Significance(p)		p=0.68		p=0.36		

Table 2: Comparison of variables among study subjects with easy and difficult laryngoscopy

Parameters	Total study population (n=300)	CL grade I & II (n=274)	CL grade III & IV(n=26)	P
M: F	0.71	0.71	0.73	0.551
Age-mean(range)	41.8(18-56)	41.4(18-55)	47(31-56)	**0.008**
Height- mean(range)	158(137-186)	159(147-186)	158(137-179)	0.275
Upper lip bite test (%)				**<0.001**
I	190(63.3)	188(68.6)	2(7.7)	
II	105(35)	85(31)	20(77)	
III	5(1.7)	1(0.4)	4(11.5)	
Modified Mallampati test (%)				**<0.001**
I	84(28)	83(30.3)	1(3.8)	
II	163(54.3)	155(56.6)	8(30.8)	
III	51(17)	36(13.1)	15(57.7)	
IV	2(0.7)		2(7.7)	
SMD				
Mean(range)	14.4(10-18)	14.5(12-18)	12.7(10-15.5)	**<0.001**
<12.5cm	13(4.3)	8(30.8)	5(1.8)	**<0.001**
RHSMD				
Mean(range)	11.08(9.4-14)	10.9 (9.4-13)	12.3(10.7-14)	**<0.001**
>11.9	40(13.3)	21(7.7)	19(73.1)	**<0.001**

6. Comparison of RHSMD and Cormack - Lehane grade

Mean RHSMD was 10.9 for CL 1&II and 12.3 for CL III&IV (p<0.001)

At a cut-off of 12.5, out of 26 study subjects with difficult laryngoscopy (CL grade III/IV glottic exposure), 11(42.3%) were classified correctly by RHSMD. The odds ratio of having CL grade III or IV in patients with RHSMD less than 12.5 was 66.2(95% confidence limit 16.7-262.9), p<0.001.

At the cut-off of 11.9, RHSMD identified 19(73.1%) out of 26 difficult laryngoscopies. The odds ratio of having CL grade III and IV in patients with RHSMD > 11.9 was 32.7(95% confidence limit 12.3-86.6), p<0.001.

Table 3: RHSMD at cut-off 12.5 and CL grade

Ratio of Height to sternomental distance (RHSMD)	Cormack- Lehane grade		Total
	CL grade I & II	CL grade III & IV	
RHSMD ≤12.5	271	15	286
RHSMD >12.5	3	11	14
Total	274	26	300

Table 4: RHSMD at cut-off 11.9 and CL grade

Ratio of Height to sternomental distance (RHSMD)	Cormack- Lehane grade		Total
	CL grade I & II	CL grade III & IV	
RHSMD ≤ 11.9	253	7	260
RHSMD > 11.9	21	19	40
Total	274	26	300

7. Combination of multiple tests and CL grade

On binary regression analysis RHSMD>11.9 (OR=19.5), ULBT class 3 (OR=15.5) and MMT class above 2 (OR=9.2) were independently associated with difficult laryngoscopy. When analysing the results of the combination of upper lip bite test, modified Mallampati test and RHSMD with a cut-off of 11.9, it identified 24 out of 26(92.3) patients with difficult laryngoscopy. The odds ratio of having CL grade III or IV in any test positive was 52.5(95% confidence limit 12-229.1), p<0.001.

Table 5: Combination of multiple tests and CL grade

Combination of 3 tests	Cormack -Lehane grade		Total
	CL grade I & II	CL grade III & IV	
All tests negative	223	2	225
Any test positive	51	24	75
Total	274	26	300

8. Comparison of different tests in predicting difficult laryngoscopy

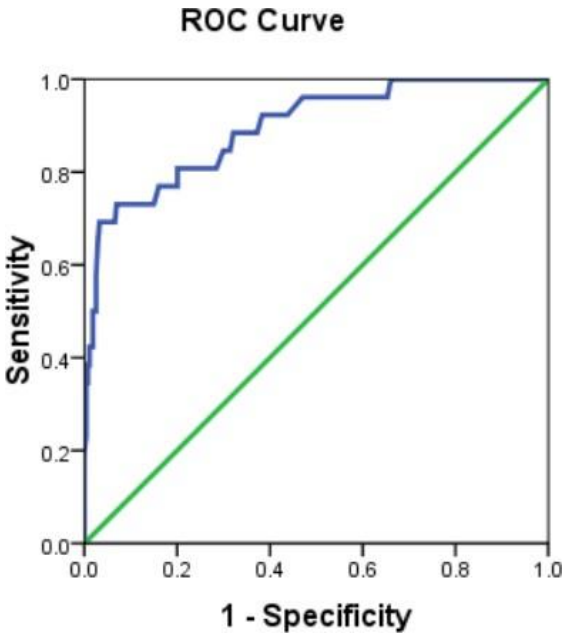
Table 6: Comparison of different tests in predicting difficult laryngoscopy

	Sensitivity	Specificity	PPV	NPV	Accuracy	LR+	LR-
Upper-lip bite test	15.4 (6.2-33.5)	99.6 (97.9-99.9)	80 (37.5-96.4)	92.5 (88.9-95)	92.33 (88.7-94.4)	42.2	0.8
Modified Mallampati class	65.4 (46.2-80.6)	86.9 (82.3-90.3)	32.1 (21.1-45.5)	96.4 (93.2-98.1)	85 (80.5-88.6)	4.96	0.4
Sternomental distance at cut-off 12.5cm	42.3 (25.5-61.1)	93.8 (90.3-96.1)	39.3 (23.5-57.5)	94.5 (91.1-96.6)	89.3 (85.3-92.3)	6.8	0.6
Ratio of Height to sternomental distance at cut-off 12.5	42.3 (23.3-63.1)	98.9 (96.8-99.7)	78.5 (52.2-92.5)	94.7 (92.8-96.1)	94.0 (90.6-96.4)	38.6	0.6
Ratio of Height to sternomental distance at cut-off 11.9	73.08 (54-86.3)	92.3 (88.6-94.9)	47.5 (33-62.5)	97.3 (94.6-98.7)	90.7 (86.9-93.5)	9.5	0.3
Combination of 3 tests	92.3 (75.9-97.9)	81.39 (76.4-85.6)	32 (22.5-43.2)	99.1 (96.8-99.8)	82.3 (77.6-86.2)	4.95	0.1

9. ROC ANALYSIS

On ROC analysis of RHSMD for predicting difficult laryngoscopy as per Cormack- Lehane grades of glottic exposure(grade III or IV), the area under ROC curve was 0.893(95% confidence interval 0.83-0.96). The optimal cut off obtained was 11.9. The sensitivity and specificity at this cut off was 73.1% and 92.3%.

Figure 1: ROC curve of RHSMD for predicting difficult laryngoscopy



DISCUSSION

Airway management is an important challenge in anaesthesia practice. Preoperative assessment of a difficult airway has critical value as failure to secure the airway can lead to morbidity and mortality. Poor glottic view during direct laryngoscopy is the most common cause of difficult intubation. Difficult laryngoscopy almost equates to a difficult airway. A complete airway assessment for every patient requiring airway management is mandatory in all guidelines.[11-13] Multiple tests have been employed to predict difficult airways. A screening test used for the prediction of difficult laryngoscopy should have high sensitivity and specificity with minimum false positive and false negative values.

In this study, we assessed the validity of RHSMD as a predictor of difficult laryngoscopy in 300 patients aged between 18 and 60 yrs., scheduled for elective surgery under general anaesthesia in Government T.D. Medical College, Alappuzha. We also compared this parameter with the upper lip bite test and modified Mallampati test.

The proportion of difficult laryngoscopy in our study was 8.7%. The reported incidence of difficult laryngoscopy in the literature is between 1.5 and 13%.[1-4,14] The wide variation in incidence could

be due to ethnic differences, the experience of the anaesthetists and the use of external laryngeal manipulation. There was no failed intubation in our study. There were no patients with difficult mask ventilation. Incidence of failed intubation in the literature ranges between 0.05 and 0.35% [5,6]. Of the 26 cases of difficult intubation, 22 were intubated in the first laryngoscopic attempt with an optimal external laryngeal manipulation. The remaining patients required two attempts. Two required changes in blade size. These four patients required a gum elastic bougie for intubation and got intubated without any significant events.

Modified Mallampati classification is among the popular preanaesthetic airway examination tools which have been in use in anaesthetic practice for many years. In our study, the sensitivity of this test to predict poor glottic view (Cormack-Lehane grade III and IV), was 65.4%. Previous studies which used Mallampati as a single predictor of difficult laryngoscopy had a wide range of sensitivity ranging from 40% to 86.7%.[15-18] This variation could be due to the inter-observer variability in the assessment of MMT. The reliability of this test depends on maximum tongue protrusion and mouth opening. There is an indistinct demarcation between class II & class III and between class III & class IV. The effect of phonation on oropharyngeal classification also contributes to inter-observer variability.[19] Overall MMT has only a moderate sensitivity for the prediction of the difficult airway. Hence it is not advisable to rely on MMT as a sole test to assess airway preoperatively. The specificity of MMT was 86.9% in our study, similar to the observations in previous studies.[20]

The sensitivity of the upper lip bite test was the lowest in our study (15.4%). The original study by Khan et al [21] reported a sensitivity of 76.5%. But such a high sensitivity was never reproduced in the subsequent studies. In a study from South India by Srinivasan and Kuppuswamy [22], the sensitivity of ULBT was only 5.8%. A study by Kim et al[23] reported the lowest sensitivity (4.5%) for this test. The ULBT class III was observed only in 1.7% of cases in our study. This resulted in a high false negative rate and lower sensitivity of ULBT. This might be due to ethnic differences. Kim et al. observed that in Asians, the scarcity of a class III ULBT could be due to an anteriorly displaced temporomandibular joint and redundant soft lip tissues.[23,24]

In view of the poor sensitivity, we cannot recommend ULBT as a single tool for accurately predicting difficult laryngoscopy. Another major drawback is the inability to perform this test in edentulous subjects. On the other hand, specificity (99.6%) and positive predictive values (80%) were the highest for ULBT compared to other tests in our study. Hence ULBT class III indicated a poor glottic view in the majority of cases. The high specificity of ULBT was observed in other studies as well. [21, 23, 25]

Savva et al [25] studied sternomental distance as a predictor of head and neck mobility and found it as the best of 5 different preoperative tests they studied. A study conducted by Ramadhani et al [26] found that this measurement is independent of age and body mass and suggested 13.5 cm as the best cut-off. However, this cut-off was not uniform across different studies and ranged between 12.5 and 15 cm. This difference may be due to the anthropometric differences between various ethnic populations. Turkan et al [27] reported a gender difference with the males having higher SMD. A study done by Varghese and Mohamed [28] in a tertiary care centre in Kerala reported a sensitivity of 68% and specificity of 93% for SMD taking a cut-off of 12.5 cm. In our study, taking the same cut off the sensitivity of SMD was 42.3% and the specificity was 93.5%. This difference in sensitivity could be explained by the more stringent exclusion criteria used in the previous study. They excluded pregnant and obese patients who were associated with a high risk for difficult laryngoscopy. SMD had the second lowest sensitivity in our study and hence it could not be suggested as a good screening tool. The specificity of the test was comparable to other parameters.

Farzi et al [8] proposed a new index for predicting difficult laryngoscopy, the ratio of height to sternomental distance. They found that RHSMD ≥12.5 had a significant association with difficult laryngoscopy. The sensitivity reported in their study was 73% and the specificity was 81.9%. Swaroop Ray et al [9] studied the validity of RHSMD in the paediatric population and found a poor predictive accuracy (AUROC 0.46). However, in their study, there was no difficult laryngoscopy and they assessed the prediction of the Grade IIb Cormack-Lehane view. Puneet Kumar et al [10]conducted a study on 131 adult patients and found AUROC for RHSMD in predicting difficult airway as 0.890 (sensitivity 84.2%, specificity 96.4%). The best cut-off was 10.5 in their study. There were not many studies in the literature testing the validity of this new index.

In our study, we found the average RHSMD of the study population as 11.08 (9.4 to 14). This parameter was independent of gender and age. We assessed the predictive accuracy using ROC analysis. The AUROC was 0.89 (0.83 to 0.96). At the cut-off of 12.5 mentioned by Farzi et al [8], RHSMD had a sensitivity of only 42.3% in our study. We found 11.9 as the best cut-off for our population with a sensitivity of 73.1% and specificity of 92.3%. No patient with a value of <10.5 had a difficult airway and all patients with a value >13 had difficult laryngoscopy.

The RHSMD above 11.9 was the best predictor of difficult laryngoscopy in our study. RHSMD is a

tool which is very easy to measure on bed side using a measuring tape and a calculator. The test is less likely to have inter-observer variability.

Among the parameters assessed in the study, age, ULBT & MMT classes, SMD and RHSMD were significantly associated with difficult laryngoscopy as per Cormack-Lehane grading. However, on binary logistic regression analysis, we found that neither age nor SMD had an independent association with difficult laryngoscopy. We observed that ULBT classes III, MMT classes above II as well as RHSMD above 11.9 were independently associated with difficult laryngoscopy.

A combination of multiple tests was proposed as the best predictor of difficult laryngoscopy. In the meta-analysis by Toshiya et al [29] combining 35 studies and covering more than fifty thousand patients, each test had poor to moderate sensitivity. A combination of tests adds to the diagnostic value. This concept was reiterated in multiple other studies [1, 10, 26]. We verified this observation by selecting the three independent predictors of difficult laryngoscopy observed in our study. We also found that the combination of different tests improved sensitivity without compromising specificity. The sensitivity of the combination of ULBT, MMT and RHSMD was 92.3% and specificity was 81.4%. However, the positive predictive value would decrease by combining different tests. Also, this method would be cumbersome and more time-consuming.

This study we conducted is among the few types of research which analyzed the predictive accuracy of the ratio of height to sternomental distance. The results of this study will shine a light on future research in defining the normal distribution and optimal cut-off of RHSMD and validating this tool as a predictor of difficult laryngoscopy.

One of the limitations of our study is that observer bias in Cormack-Lehane grading could be possible as laryngoscopy was done by different anaesthesiologists, and the experience and skill may vary. The results may not apply to other ethnic groups. We excluded the elderly and paediatric population and the results could not be generalized to these groups. We need further studies to validate our findings and to reach an optimum cut-off for our population.

CONCLUSION

The ratio of height to sternomental distance is an accurate tool for predicting difficult laryngoscopy. It is a better screening test for difficult laryngoscopy compared to the upper lip bite test, modified Mallampati test and sternomental distance. The combination of multiple tests improves the diagnostic accuracy of individual tests and decrease the incidence of difficult intubation. Even with combination of all these preoperative assessments, all difficult airway cases may not be identifiable which shows no test in current practice is ideal and we should search for more tests.

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