

# Comparison of Upper Lip Bite Test and Modified Mallampati Classification as Predictor of Difficult Intubation in Patients for Surgery under General Anaesthesia

Kaveri Patel<sup>1</sup>, Kannauj Swargiri<sup>2</sup>, Barnita Basumatary<sup>3</sup>, Arunima Saikia<sup>4</sup>

<sup>1</sup>Post Graduate Student, Department of Anaesthesiology, Jorhat Medical College and Hospital, Assam, India  
Corresponding Author Email: [kaveripatel274\[at\]gmail.com](mailto:kaveripatel274[at]gmail.com)

<sup>2</sup>Associate Professor, Department of Anaesthesiology, Jorhat Medical College and Hospital, Assam, India  
Email: [kannaujswargiri\[at\]gmail.com](mailto:kannaujswargiri[at]gmail.com)

<sup>3</sup>Assistant Professor, Department of Anaesthesiology, Jorhat Medical College and Hospital, Assam, India  
Email: [bnita13\[at\]gmail.com](mailto:bnita13[at]gmail.com)

<sup>4</sup>Professor & Head, Department of Anaesthesiology, Jorhat Medical College and Hospital, Assam, India  
Email: [marunimadr\[at\]yahoo.co.in](mailto:marunimadr[at]yahoo.co.in)

**Abstract:** ***Background and aims:** Securing unobstructed airway is of prime importance for Anaesthesiologist, thus difficult endotracheal intubation remains an important concern. It contributes significantly to peri - operative mortality and morbidity. The study aims to compare the effectiveness of ULBT with MMT for predicting difficult intubation in adult patient needing surgery under general anaesthesia. **Materials and method:** The present study was a prospective observational study conducted at Jorhat Medical College and Hospital, Jorhat, Assam. 63 patients were included in this study. **Result:** In this study, 7 (11.1%) patients were in difficult and 56 (88.9%) patients were in easy Cormack Lehane Score Group. ULBT Grade had sensitivity of 28.6 %, specificity of 98.2%, positive predictive value of 66.7, negative predictive value of 91.7 and accuracy of 90.5. MMT had sensitivity of 57.1%, specificity of 87.5%, positive predictive value of 36.4 %, negative predictive value of 94.2 % and accuracy of 84.1%. **Conclusion:** Though the sensitivity of MMT is higher than the ULBT, later has got better positive predictive ability for difficult endotracheal intubation. Though ULBT showed higher specificity than MMT, both ULBT and MMT had fairly high specificity. MMT and ULBT appear to be better predictors for easy intubations rather than difficult intubations.*

**Keywords:** Upper Lip Bite Test, Modified Mallampati Classification, Difficult intubation

## 1. Introduction

Securing unobstructed airway is of prime importance for Anaesthesiologist. Inability to maintain a patent airway results in inadequate ventilation and oxygenation leading to hypoxic brain damage and death. Difficult endotracheal intubation remains an important concern for achieving an unobstructed airway. American Society of Anaesthesiologists (ASA) defines difficult intubation as a tracheal intubation requiring multiple attempts, in the presence or absence of tracheal pathology. The incidence of difficult intubation in surgical patients undergoing general anaesthesia is estimated to be approximately 1–18%, whereas that of failure to intubate is 0.05–0.35%<sup>1, 2, 3</sup>. It was observed that the wide variation in the prevalence of difficult intubation can be explained by different definition used<sup>4, 5</sup>.

Difficult intubation contributes significantly to peri - operative mortality and morbidity. Various methods have been used for prediction of difficult laryngoscopy comparing either individual parameters or by using scoring systems<sup>6, 7, 8</sup>.<sup>9</sup>. Some of the predictors include high Mallampati score, increasing neck circumference, a history of obstructive sleep apnoea syndrome, obesity, short neck, thyromental distance, increased age, and male gender. Several literatures indicate

that the modified Mallampati classification has relatively high specificity but low sensitivity and a high number of false positive results<sup>10, 11, 12</sup>. Other tests, such as thyromental distance, interincisor gap, subluxation of mandible, length of mandibular rami, chin protrusion and atlanto - occipital extension are not totally reliable because of little value in predicting a difficult intubation<sup>13</sup>.

Recently, a new technique to evaluate for difficult intubation was reported. The test is classified according to the ability to bite the upper lip with the lower teeth. The researchers state the anatomical distinction between the ULBT and the other preoperative airway evaluation methods lies in the range and freedom of movement of the mandible and the architecture of the teeth. In a sample of 300, the ULBT was found to have an accuracy of 88% and specificity was 88.7% for predicting difficult intubation. Other literatures reported that the upper lip bite test is a useful predictor of difficult intubation. Although, upper lip bite has been shown to be a promising test in its introductory article<sup>7</sup>, repeated validation in various populations is required for any test to be accepted as a routine test.

The Upper Lip Bite Test (ULBT) can be an alternative to Modified Mallampati Test (MMT). It had showed significantly higher specificity and accuracy than the

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modified Mallampati test, but more studies are required. Thus, it was useful to observe the comparison of the Upper Lip Bite Test (ULBT) and Modified Mallampati Test (MMT) in predicting difficult intubation.

Ideally, any preoperative assessment of difficult tracheal intubation should have high sensitivity and specificity to result in minimal false positive or negative values.

We undertook the present study to compare the effectiveness of Upper Lip Bite Test (ULBT) with modified Mallampati test (MMT) in predicting difficult intubation under GA and also to determine the sensitivity of the Upper lip bite test (ULBT) in predicting difficult intubation.

## 2. Methodology & Materials

This was a hospital based Observational study, carried out under the Department of Anaesthesiology, Jorhat Medical College and Hospital, Jorhat from January 2022 to January 2023, with the prior permission and approval from the Institutional Ethical Committee. Study population was patient undergoing elective surgery under general anaesthesia. The prevalence of difficult intubation among Indian patients as observed by Balakrishnan et al., Bhat et al., Aswar et al. and Singh et al.<sup>14-17</sup> was 4.7%, 7.8%, 8% and 9.4% respectively. Taking the highest prevalence in above studies of 9.4%, a precision of 7.5% and considering 95% confidence; the sample size estimated for their primary objective was approximately 60. Sampling technique used was consecutive sampling technique.

For the selection of cases, inclusion criteria were that the patients should have given written informed consent, had ASA Grade I and II, was aged 18 - 65 years irrespective of gender, and was scheduled for elective surgery under general anaesthesia requiring endotracheal intubation. The exclusion criteria were the refusal to participate in the study, ASA Grade III and IV, patients coming for surgery under regional anaesthesia, patients with upper airway pathologies, tumours, facial and maxillary fractures, obstetrics patients and cervical spine fractures, patients who were not able to lie supine, sit or perform the airway assessment tests, and patients coming for emergency surgeries.

On the day prior to the scheduled date of proposed surgery, a thorough history was taken and clinical examination of all the patients were done, assessing the General Physical Status & Systemic Examination. Preanaesthetics assessment was done in participating patients before surgery which included age, gender, weight, height, BMI, neck mobility, Upper Lip Bite Test (ULBT) Grade, and Modified Mallampati Test (MMT). Operation theatre assessment included classification of patients as per Cormack - Lehane system as per the views obtained by direct laryngoscopy based on the structures seen. Also, patients were divided into easy and difficult intubation based on number of intubations attempts and difficulty experienced by anaesthetist intubating. Attempt at intubation were done by the anaesthetist of at least three years of experience in anaesthesia and airway management.

For statistical analysis data were entered into a Microsoft excel spreadsheet and then analyzed by SPSS (version 27.0;

SPSS Inc., Chicago, IL, USA) and Graph Pad Prism version 5. Data had been summarized as mean and standard deviation for numerical variables and count and percentages for categorical variables. Two - sample *t* - tests for a difference in mean involved independent samples or unpaired samples. Paired *t* - tests were a form of blocking and had greater power than unpaired tests. A chi - squared test ( $\chi^2$  test) was any statistical hypothesis test wherein the sampling distribution of the test statistic is a chi - squared distribution when the null hypothesis is true. Without other qualification, 'chi - squared test' often is used as short for Pearson's chi - squared test. Unpaired proportions were compared by Chi - square test or Fischer's exact test, as appropriate. Explicit expressions that can be used to carry out various *t* - tests are given below. In each case, the formula for a test statistic that either exactly follows or closely approximates a *t* - distribution under the null hypothesis is given. Also, the appropriate degrees of freedom are given in each case. Each of these statistics can be used to carry out either a one - tailed test or a two - tailed test. Once a *t* value is determined, a *p* - value can be found using a table of values from Student's *t* - distribution. If the calculated *p* - value is below the threshold chosen for statistical significance (usually the 0.10, the 0.05, or 0.01 level), then the null hypothesis is rejected in favour of the alternative hypothesis. *P* - value  $\leq 0.05$  was considered for statistically significant.

## 3. Result & Observation

The present study is a prospective observational study to compare upper lip bite test and modified mallampati classification as predictor of difficult intubation in patients for surgery under general anaesthesia. This study was conducted from January 2022 to January 2023 in 63 patients of either gender. After conducting the whole study, the data were analysed and appropriate statistical tests were applied wherever indicated.

In this study, the mean Age of patients was 41.9 years, height was 159.2 cms, weight was 55.6, BMI was 21.8, pulse was 78.5, respiratory rate was 17.69, SBP was 116.0 mm, and DBP was 75.9 mm. 13 (20.6%) patients were 21 - 30 years of age, 20 (31.7%) patients were 31 - 40 years of age, 12 (19.0%) patients were 41 - 50 years of age and 18 (28.6%) patients were 51 - 60 years of age. 65.1% patients were female and 34.9% patients were male. 93.7% patients were Hindu and 6.3% patients were Muslim. 16 patients had hypertension, 4 patients had diabetes mellitus, 1 patient had Asthma, and 1 patient had epilepsy. No patients had drug allergy and no patient was found to be on drug therapy. 4 patients had previous anaesthetic experience. 3 patients were smoker, 3 patients were alcoholic, and 26 patients had other drug addiction.

In this study, 37 (58.7%) patients had ASA Grade 1 and 26 (41.3%) patients had ASA Grade 2. 6 (9.5%) patients had abnormal teeth, 1 (1.6%) patient had loose tooth and 56 (88.9%) patients had normal teeth. All patients had with normal TM joint stiffness or jaw movement and adequate in mouth opening. 1 (1.6%) patient had short neck.

**Table 1:** Distribution of ULBT Grade

ULBT Grade	Frequency	Percent
1	46	73.00%
2	14	22.20%
3	3	4.80%
<b>Total</b>	63	100.00%

**Table 2:** Distribution of MMT score

MMT score	Frequency	Percent
1	24	38.10%
2	28	44.40%
3	10	15.90%
4	1	1.60%
<b>Total</b>	63	100.00%

**Table 3:** Distribution of Cormack Lehane Score

Cormack Lehane Score	Frequency	Percent
1	31	49.20%
2	25	39.70%
3	6	9.50%
4	1	1.60%
<b>Total</b>	63	100.00%

As shown in table 1, 73.0% patients had ULBT Grade 1, 22.2% patients had ULBT Grade 2 and 4.8% patients had ULBT Grade 3. Thus, 4.8% patients had difficult and 95.2% patients had easy in ULBT Grade Group. Table 2, shows that 38.1% patients had MMT score 1, 44.4% patients had MMT score 2, 15.9% patients had MMT score 3 and 1.6% patient had MMT score 4. Thus, 17.5% patients had difficult and 82.5% patients had easy in MMT score Group. As depicted in table 3, 49.2% patients had Cormack Lehane Score 1, 39.7% patients had Cormack Lehane Score 2, 9.5% patients had Cormack Lehane Score 3 and 1.6% patient had Cormack Lehane Score 4. Thus, 11.1% patients had difficult and 88.9% patients had easy in Cormack Lehane Score Group.

**Table 4:** Distribution of ULBT Grade Group, MMT Score Group, Cormack Lehane Score Group

	ULBT Grade Group	MMT Score Group	Cormack Lehane Score Group
Difficult	3 (4.8%)	11 (17.5%)	7 (11.1%)
Easy	60 (95.2%)	52 (82.5%)	56 (88.9%)
<b>Total</b>	63 (100.0%)	63 (100.0%)	63 (100.0%)

**Table 5:** Distribution of Intubation

Intubation	Frequency	Percent
Easy	56	88.90%
Difficult	7	11.10%
<b>Total</b>	63	100.00%

In our study, as depicted in Table 5, 56 (88.9%) patients had Easy and 7 (11.1%) patients had Difficult Intubation. Association of age group, mean age, mean height, sex, religion, mean pulse, mean respiratory rate, mean systolic BP, mean diastolic BP, hypertension, diabetes mellitus, asthma, epilepsy, previous anaesthetic experience, smoking, alcohol, other drug addictions, body built and ASA Grade with Cormack Lehane Score Group was not statistically significant. Association of teeth, mean weight, mean BMI, and neck mobility with Cormack Lehane Score Group was statistically significant.

**Table 6:** Association between ULBT Grade: Cormack Lehane Score Group

CORMACK LEHANE SCORE GROUP			
ULBT Grade	Easy	Difficult	TOTAL
1	46	0	46
Row %	100	0	100
Col %	82.1	0	73
2	9	5	14
Row %	64.3	35.7	100
Col %	16.1	71.4	22.2
3	1	2	3
Row %	33.3	66.7	100
Col %	1.8	28.6	4.8
<b>TOTAL</b>	56	7	63
Row %	88.9	11.1	100
Col %	100	100	100

**Chi - square value:** 23.7054; **p - value:** <0.0001

In Easy, 46 (82.1%) patients were ULBT Grade 1, 9 (16.1%) patients were ULBT Grade 2 and 1 (1.8%) patient was ULBT Grade 3. In Difficult, 5 (71.4%) patients were ULBT Grade 2 and 2 (28.6%) patient was ULBT Grade 3. Association of ULBT Grade with Cormack Lehane Score Group was statistically significant (p<0.0001) (Table 6).

**Table 7:** Association between ULBT Grade Group: Cormack Lehane Score Group

CORMACK LEHANE SCORE GROUP			
ULBT Grade Group	Easy	Difficult	TOTAL
<b>Easy</b>	55	5	60
Row %	91.7	8.3	100
Col %	98.2	71.4	95.2
<b>Difficult</b>	1	2	3
Row %	33.3	66.7	100
Col %	1.8	28.6	4.8
<b>TOTAL</b>	56	7	63
Row %	88.9	11.1	100
Col %	100	100	100

**Chi - square value:** 9.8438; **p - value:** 0.0017; **Odds ratio:** 22.0000 (1.6852, 287.2059)

In Easy, 55 (82.1%) patients had Easy ULBT Grade Group (that is grade I and II ULBT) and 1 (1.8%) patient had Difficult ULBT Grade Group (that is grade III ULBT). In Difficult, 5 (71.4%) patients had Easy ULBT Grade Group and 2 (28.6%) patients had Difficult ULBT Grade Group. Association of ULBT Grade Group with Cormack Lehane Score Group was statistically significant (p=0.0017). (Table 7)

**Table 8:** Association between MMT score: Cormack Lehane Score Group

CORMACK LEHANE SCORE GROUP			
MMT score	Easy	Difficult	TOTAL
1	23	1	24
Row %	95.8	4.2	100
Col %	41.1	14.3	38.1
2	26	2	28
Row %	92.9	7.1	100
Col %	46.4	28.6	44.4
3	7	3	10
Row %	70	30	100
Col %	12.5	42.9	15.9
4	0	1	1

Row %	0	100	100
Col %	0	14.3	1.6
<b>TOTAL</b>	56	7	63
Row %	88.9	11.1	100
Col %	100	100	100

Chi - square value: 13.2308; p - value: 0.0042

In Easy, 23 (41.1%) patients were MMT score 1, 26 (46.4%) patients were MMT score 2 and 7 (12.5%) patients MMT score 3. In Difficult, 1 (14.3%) patient was MMT score 1, 2 (28.6%) patients were MMT score 2, 3 (42.9%) patients were MMT score 3 and 1 (14.3%) patients MMT score 4. Association of MMT score with Cormack Lehane Score Group was statistically significant (p=0.0042). (Table 8)

**Table 9:** Association between MMT score Group: Cormack Lehane Score Group

CORMACK LEHANE SCORE GROUP			
MMT score Group	Easy	Difficult	TOTAL
<b>Easy</b>	49	3	52
Row %	94.2	5.8	100
Col %	87.5	42.9	82.5
<b>Difficult</b>	7	4	11
Row %	63.6	36.4	100
Col %	12.5	57.1	17.5
<b>TOTAL</b>	56	7	63
Row %	88.9	11.1	100
Col %	100	100	100

Chi - square value: 8.6047; p - value: 0.0033

Odds ratio: 9.3333 (1.7161, 50.7620)

In Easy, 49 (87.5%) patients had Easy MMT score Group and 7 (1.8%) patients had Difficult MMT score Group. In Difficult, 3 (42.9%) patients had Easy MMT score Group and 4 (57.1%) patients had Difficult MMT score Group. Association of MMT score Group with Cormack Lehane Score Group was statistically significant (p=0.0033). (Table 9)

**Table 10:** Association between Cormack Lehane Score: Cormack Lehane Score Group

CORMACK LEHANE SCORE GROUP			
Cormack Lehane Score	Easy	Difficult	TOTAL
<b>1</b>	31	0	31
Row %	100	0	100
Col %	55.4	0	49.2
<b>2</b>	25	0	25
Row %	100	0	100
Col %	44.6	0	39.7
<b>3</b>	0	6	6
Row %	0	100	100
Col %	0	85.7	9.5
<b>4</b>	0	1	1
Row %	0	100	100
Col %	0	14.3	1.6
<b>TOTAL</b>	56	7	63
Row %	88.9	11.1	100
Col %	100	100	100

Chi - square value: 63.0000; p - value: <0.0001; Odds ratio: 1.6250 (0.7063, 3.7388)

In Easy, 31 (55.4%) patients were Cormack Lehane Score 1 and 25 (44.6%) patients were Cormack Lehane Score 2. In Difficult, 6 (85.7%) patients were Cormack Lehane Score 3

and 1 (14.3%) patient was Cormack Lehane Score 4. Association of Cormack Lehane Score with Cormack Lehane Score Group was statistically significant (p<0.0001). (Table 10)

**Table 11:** Association between Intubation: Cormack Lehane Score Group

CORMACK LEHANE SCORE GROUP			
Intubation	Easy	Difficult	TOTAL
<b>Easy</b>	56	0	56
Row %	100	0	100
Col %	100	0	88.9
<b>Difficult</b>	0	7	7
Row %	0	100	100
Col %	0	100	11.1
<b>TOTAL</b>	56	7	63
Row %	88.9	11.1	100
Col %	100	100	100

Chi - square value: 63.0000; p - value: <0.0001

In Easy, 56 (100%) patients had Easy Intubation. In Difficult, 7 (100%) patients had Difficult Intubation. Association of Intubation with Cormack Lehane Score Group was statistically significant (p<0.0001). (Table 11)

**Table 12:** Association between ULBT Grade Group: Cormack Lehane Score Group

CORMACK LEHANE SCORE GROUP			
ULBT Grade Group	Difficult	Easy	TOTAL
<b>Difficult</b>	2	1	3
Row %	66.7	33.3	100
Col %	28.6	1.8	4.8
<b>Easy</b>	5	55	60
Row %	8.3	91.7	100
Col %	71.4	98.2	95.2
<b>TOTAL</b>	7	56	63
Row %	11.1	88.9	100
Col %	100	100	100

Chi - square value: 9.8438; p - value: 0.0017; Odds ratio: 22.0000 (1.6852, 287.2059)

According to table 12, ULBT Grade Group Vs. Cormack Lehane Score Group Sensitivity: 28.6, Specificity: 98.2, Positive Predictive Value: 66.7, Negative Predictive Value: 91.7 and Accuracy: 90.5%.

**Table 13:** Association between MMT score Group: Cormack Lehane Score Group

CORMACK LEHANE SCORE GROUP			
MMT score Group	Difficult	Easy	Total
<b>Difficult</b>	4	7	11
Row %	36.4	63.6	100
Col %	57.1	12.5	17.5
<b>Easy</b>	3	49	52
Row %	5.8	94.2	100
Col %	42.9	87.5	82.5
<b>TOTAL</b>	7	56	63
Row %	11.1	88.9	100
Col %	100	100	100

Chi - square value: 8.6047; p - value: 0.0033; Odds ratio: 9.3333 (1.7161, 50.7620)

According to table 13, MMT score Group Vs. Cormack Lehane Score Group Sensitivity: 57.1, Specificity: 87.5,

Positive Predictive Value: 36.4, Negative Predictive Value: 94.2 and Accuracy: 84.12%.

#### 4. Discussion

Airway management remains an important task in the practice of anaesthesia and unexpected difficult intubation is challenging situation. Preoperative airway assessment facilitates appropriate preparation when difficulty with intubation or ventilation is anticipated prior to induction of anaesthesia. Studies were conducted to identify the factors which may help in predicting difficult intubation.

Also, many preoperative tests were studied to predict difficult airway, but they are far from being ideal. Over the years, quest had been made to find a test which is easy to perform, highly sensitive, highly specific and which has high positive predictive value with few false positive predictions. One such test, Modified Mallampati Test (MMT) has been in use for more than two decades and over the years many limitations have been pointed out by various authors. The absence of definite demarcation between the class II, class III and IV groups and the effect of phonation on the oropharyngeal classification leads to higher inter observer variability and decreased reliability, as observed by Tham EJ<sup>18</sup>. Another limitation of MMT includes, the fact that the test does not assess neck mobility which is an important factor in predicting difficult intubation.

Another test Upper Lip Bite test (ULBT) was studied by Khan ZH et al<sup>7</sup> and they found out that ULBT was easy to perform within seconds of demonstrating it to the patients and very convenient to perform as a bedside test. The classes are clearly demarcated and delineated making inter observer variability highly unlikely while using this test.

Both these tests have their advantages, and multiple studies had been conducted to compare the efficacy but the results varied.

The current prospective study compares Upper Lip Bite Test (ULBT) with Modified Mallampati Test (MMT) for predicting difficulty during endotracheal intubation in 63 patients of both sexes, aged between 18 years to 65 years undergoing elective surgery under general anaesthesia.

Worldwide incidence of difficult intubation in surgical patients undergoing general anaesthesia is estimated to be approximately 1–18%, whereas that of failure to intubate is 0.05–0.35% as observed by Tse JC et al; Cattano D et al; Frerk CM et al<sup>1, 2, 3</sup>. In our study, incidence of difficult intubation was found to be around 11.1% which is comparable to the results recently obtained in study done in south India by Thomas Met al<sup>19</sup>. However, previously reported incidence of difficult intubation among Indian population ranges from 4.7 % to 9.4% as observed by Balakrishnan R et al; Singh A, et al; Bhat et al; Aswar SG et al<sup>14-17</sup>. This wide variation in incidence is due to the criteria that are used to define the difficult intubation and different anthropometric features among populations. There were no failures to intubate the trachea in any of the patients of our study.

Moon HY et al<sup>20</sup> in 2013 observed that difficulty in endotracheal intubation is expected to increase with age of patients due to degenerative changes such as dental loss and head and neck joint changes. In our study, age or distribution of mean age was not statistically significant with Cormack Lehane Score Group. Thus, our study was not able to appreciate the expected increase in difficult intubation with age, which could be explained by higher number of patients from younger age group and smaller sample size.

The mean Weight was lower [54.5000 ± 10.0544] in Easy group compared to Difficult group [64.1429 ± 12.3346] which was statistically significant (p=0.0228), which was similar to the findings of Wang T et al<sup>21</sup>. The mean BMI was lower [21.3464 ± 3.1208] in Easy group compared to Difficult group [25.6571 ± 2.5231] it was statistically significant (p=0.0009), which was similar to the findings Uribe AA et al<sup>22</sup>.

We showed that, higher number of patients had [33 (58.9%) ] ASA Grade 1 in Easy group compared to [4 (57.1%) ] Difficult group though it was not statistically significant (p=0.9279). Most of the patients had [56 (100%) ] Normal Neck Mobility in Easy group compared to [6 (85.7%) ] Difficult group it was statistically significant (p=0.0043). Higher number of patients had Normal Teeth [52 (92.9%) ] in Easy group compared to [4 (57.1%) ] Difficult group which was statistically significant (p=0.0061).

Association of ULBT Grade with Cormack Lehane Score Group was statistically significant (p<0.0001). Association of ULBT Grade Group with Cormack Lehane Score Group was statistically significant (p=0.0017). Association of MMT score with Cormack Lehane Score Group was statistically significant (p=0.0042). Association of MMT score Group with Cormack Lehane Score Group was statistically significant (p=0.0033). We observed that, majority number of patients had [49 (87.5%) ] Easy MMT score Group in Easy group compared to [4 (57.1%) ] Difficult group which was statistically significant (p=0.0033).

In the present study all Easy group patient as per Cormack Lehane score that is 56 (100%) patients were observed to have Easy Intubation, while all Difficult group patient as per Cormack Lehane score, that is 7 (100%) patients were observed to have Difficult Intubation. Association of Intubation with Cormack Lehane Score Group was statistically significant (p<0.0001).

In our study, we found the sensitivity of MMT to be 57.1% which was almost near to the study conducted by Sharma N et al<sup>23</sup> (62.5%) and Rao CS et al<sup>24</sup> (60%), and the meta-analysis done by Lee A et al<sup>25</sup> (50%) and Shiga T et al<sup>26</sup> (49%). The specificity of MMT in our study is 87.5 % which is almost same as Sharma N et al<sup>23</sup> (86.6%), Aswar SG<sup>17</sup> et al (91.3%), Koirala Set al<sup>27</sup> (91.1%), and Kanase NV et al<sup>28</sup> (89.0 %), and the meta-analysis done by Lee A et al<sup>25</sup> (89 %) and Shiga T et al<sup>26</sup> (86%) but is lower than what was observed by Rao CS et al<sup>24</sup> (97.9 %). The variations in reported specificity in various studies may be because of incorrect evaluation of the test and inter observer variability seen in MMT as was also found by Eberhart et al<sup>29</sup>. The

positive predictive value of MMT in our study was 36.4 % which is same as observed by Aswar SG et al<sup>17</sup> (42.9%) and Kanase NV et al<sup>28</sup> (45.5%), but is higher than what was observed Khan ZH et al<sup>30</sup> (13%), Sharma N et al<sup>23</sup> (25%), and Koirala S et al<sup>27</sup> (10%). This can be explained by the fact that, all the patients' airway was evaluated by a single resident, unlike in other studies where in two or more than two Anaesthesiologists were being involved in assessing the airway, which might have contributed to the inter observer variability in their study leading to high false positivity. The negative predictive value of MMT was 94.2 %, which is almost same as observed in the study done by Aswar SG et al<sup>17</sup> (97.7%), Sharma N et al<sup>23</sup> (97%), Rao CS et al<sup>24</sup> (97.9%), Koirala S et al<sup>27</sup> (82.9%), Kanase NV et al<sup>28</sup> (98.6%), and Khan ZH et al<sup>30</sup> (98.4%). The accuracy of MMT score was observed to be 84.1.

The sensitivity of ULBT in our study was 28.6 %, which is less than Khan ZH et al<sup>30</sup> (76.5%) and Kanase NV et al<sup>28</sup> (76.5%). The specificity of ULBT in our study was 98.2% which was same as observed by Aswar SG et al<sup>17</sup> (95.1%), Sharma N et al<sup>23</sup> (91.1%), Rao CS et al<sup>24</sup> (97.4%), Koirala et al<sup>27</sup> (100%), Kanase NV et al<sup>28</sup> (87.19%), and Khan ZH et al<sup>30</sup> (88.7%). The PPV of ULBT in our study was 66.7% which was more than as observed by Aswar SG et al<sup>17</sup> (30.8%), Sharma N et al<sup>23</sup> (23.1%), Rao CS et al<sup>24</sup> (37.5%), Kanase NV et al<sup>28</sup> (38.2%), and Khan ZH et al<sup>30</sup> (28.9%). The NPV was 91.7% which was observed by Aswar SG et al<sup>17</sup> (93.6%), Sharma N et al<sup>23</sup> (95.3%), Rao CS et al<sup>24</sup> (96.4%), Koirala et al<sup>27</sup> (91%), Kanase NV et al<sup>28</sup> (97.27%), and Khan ZH et al<sup>30</sup> (98.4%).

On comparing both the tests, we found that MMT is more sensitive (57.1% Vs.28.6%) than ULBT. Both MMT and ULBT has high specificity (87.5% Vs.98.2%). ULBT has higher positive predictive value (66.67% Vs.36.36%). Both MMT and ULBT has high negative predictive value (94.2% Vs.91.7%). Both the tests have a negative predictive value more than 90%, thus stressing the fact that all these tests can be good predictors of easy intubation, rather as positive predictors of difficult intubation which has a very low incidence. Incidentally, during the study, we found that repeated demonstrations were required for patients to perform ULBT and a few failed to understand the procedure in spite of our efforts. The distinct advantage of ULBT as we found out, included less or no chance for inter observer variability because of clear demarcation of the different classes and the appreciation of buck teeth during assessment which is one of the important factors predicting difficult intubation.

Future scope: A study in future with larger sample size and also using these tests in conjunction with other tests of airway assessment viz. thyromental distance, hyomental distance, inter incisor distance to predict difficult airway may prove to be better to predict difficult intubation.

## 5. Conclusion

In this prospective observational study, we have compared ULBT and MMT for the prediction of difficult endotracheal intubation in 63 patients of either gender, of ASA grade I/II in the age group of 18 - 65 years scheduled for elective surgery under general anaesthesia. The study involved

preoperative evaluation of airway by MMT and ULBT. MMT grade III and IV, ULBT class III were considered as predictors of difficult endotracheal intubation. Laryngoscopy was done in sniffing position, glottic views were graded according to the Cormack and Lehane classification. Patients of Cormack Lehane class III / IV were considered as difficult to intubate. Though the sensitivity of MMT is higher than the ULBT, later has got better positive predictive ability for difficult endotracheal intubation. ULBT showed higher specificity than MMT, both ULBT and MMT had fairly high specificity. MMT and ULBT appear to be better predictors for easy intubations rather than difficult intubations.

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