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Airway Assessment in Patients Undergoing Surgery and General Anaesthesia and its Application in Prediction of Difficult Airway

Nandita Kad [a], Mangal S Ahlawat [a, *], Nikita Bajaj [b], Priyanka Bansal [a]

[a] *Department of Anaesthesia, Pandit Bhagwat Dayal Sharma University of Health Sciences, Rohtak, India*
[b] *Consultant Anaesthetist, Panipat, India*

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ABSTRACT

Background and aim: Anaesthesiologists face challenges in airway management, but pre-anesthetic airway assessment helps identify potential complications and prepare alternative plans for children with challenging airways. The primary goal of airway assessment during pre-anesthetic evaluation is to identify difficult airways and prepare alternative treatments for mask ventilation, direct laryngoscopy, and endotracheal intubation.

Material and methods: Patients aged 8-14 years, of either sex, with an American Society of Anesthesiologists (ASA) grade I or II, were included. Four parameters, namely the modified Mallampati test, neck circumference, measurement of thyromental distance, and the Ratio of height to thyromental distance, were assessed pre-operatively using the same flexible measuring tape to avoid instrumental bias. These parameters were then correlated with Cormack and Lehane's grading system for assessing a difficult airway.

Results: All four parameters, namely modified Mallampati test, thyromental distance, Ratio of height to thyromental distance, and neck circumference, were found to be statistically significant in predicting difficult airway in children of the age group 8-14 years. Out of the four parameters assessed, the Ratio of Height to Thyromental Distance (RHTMD) had the highest sensitivity of 98.41%, followed by Mallampati grading (MPG) with a sensitivity of 96.83%, suggesting that they are highly sensitive predictors of difficult airways in children.

Conclusions: To predict airway status in children, the modified Mallampati test is the most useful parameter, which can be used as a bedside screening test in the 8-14 year age group, as it has high sensitivity and the highest diagnostic accuracy.

1. Introduction

Airway management has always been a challenging task for anaesthesiologists. The reported incidence of difficult laryngoscopy or endotracheal intubation varies from 1.5% to 13% in patients undergoing surgery under general anesthesia. Anticipation of a difficult airway and, hence, the difficult intubation makes it more convenient for an anaesthesiologist to provide efficient care and necessary steps to be taken at the right time. Pre-anesthetic airway assessment gives a significant idea about the possible complications that one can face while securing the airway. An anesthesiologist can face many challenges during direct laryngoscopy and intubation (large tongue, micrognathia, high arched palate, narrow subglottic space), which require rapid intervention if not anticipated earlier. Difficult face mask ventilation is indicated when multiple manipulations are required, such as using two hands and making adjustments to the head and neck. Difficult laryngoscopy occurs when there is a failure to visualize the vocal cords. Difficult tracheal intubation has been defined as requiring multiple attempts involving more than one provider, the use of adjuncts, or necessitating the use of an alternative device after primary attempts have failed.[1] The incidence of DL in operation theatres is 2.8%, and in emergency trauma patients, it can be as high as 14%. Difficult airway (DA) is defined as the clinical situation in which a conventionally trained anaesthesiologist experiences difficulty with face mask ventilation of the upper airway, difficulty with tracheal intubation, or both.[2] Failure to anticipate a DA, along with insufficient planning for airway management, is one of the leading causes of DA-related complications for an anesthesiologist. Predicting a difficult airway becomes increasingly valuable and important in children, as they tend to desaturate rapidly if the airway is not secured within a given timeframe. Additionally, there are significant physiological and anatomical differences in the airways of children compared to those of adults. Poor airway management is one of the significant reasons for anesthesia-related cardiac arrest, death, and brain injury in healthy children.[3] Even among pediatric anesthesiologists and intensive care physicians who are trained in pediatric airway management, failure to manage the airway is one of the primary events leading to morbidity and mortality.4 Compared with adults,

* *Corresponding author. Mangal S Ahlawat*
E-mail address: *drmangalahlawat@gmail.com*
Department of Anaesthesia, Pandit Bhagwat Dayal Sharma University of Health Sciences, Rohtak, India
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children have a more cephalad larynx, a relatively larger head and tongue, a narrow, floppy, U- shaped epiglottis, and a smaller mouth opening. Moreover, time for endotracheal intubation is also limited due to higher oxygen consumption.[5] As the pediatric patient grows, the occiput becomes less pronounced, the oral cavity becomes larger, and the angle of the mandible becomes 120 degrees. The epiglottis broadens, and its axis becomes parallel to the trachea. There is a marked descent of the larynx from birth till 3 years, eventually reaching the adult level of C5-6 following puberty.[6] In the pediatric perioperative cardiac arrest registry, 20% of cardiac arrests were attributed to respiratory complications.[7] During pre-anesthetic checkups, all patients should get an airway examination done, including history and physical examination. For airway assessment, various clinical parameters such as Mallampati score, hyomental, sternomental, thyromental, neck movements, mouth opening, Upper lip bite test (ULBT), Ratio of height to thyromental distance, and neck circumference are used to predict a DA.[8] The number of tests, measurements, scales, and scores for airway evaluation that are commonly used in adults can not be applied to children. The primary goal of airway assessment during pre-anesthetic evaluation is to identify a difficult airway and prepare an alternative plan for children in whom mask ventilation, direct laryngoscopy, and endotracheal intubation may be challenging.[4]

2. Material and Methods

Study design

Prospective observational clinical trial.

Study site

Department of anaesthesiology and critical care Pt BDS PGIMS Rohtak.

Participants section

Pediatric patients aged 8-14 years. Airway assessment in patients aged 8-14 years planned for surgery under general anesthesia was conducted in the Department of Anaesthesiology and Critical Care, Pt. B.D. Sharma PGIMS, Rohtak as a prospective observational study after obtaining approval from the institutional ethical committee and informed, written consent from the parent/guardian of each child.

Inclusion criteria

Patients of age group 8-14 years belonging to either sex with ASA grade I or II were included in the study.

Exclusion criteria

Patients who refused to participate in the study. Body mass index (BMI) at or above the 95th percentile for children of the same age and sex was considered. Uncooperative patients, including those with known airway problems such as head and neck deformities, congenital upper airway abnormalities, head and neck swelling, scarring, neck contractures, temporomandibular joint (TMJ) dysfunction, and neck movement limitations were excluded from the study.

Modified mallampati test (MMT)

Grade I- Faucial pillars, uvula, soft palate, hard palate visible Grade II: Uvula, soft palate, hard palate visible Grade III: - Base of uvula or none, soft palate and hard palate visible Grade IV-Only hard palate visible. Grades I and II were thought to indicate simple intubation. Grades III and IV were seen as indicators of challenging intubation.[8]

Thyromental distance (TMD)

The patients were instructed to keep their mouths closed and to extend their necks fully. Next, the distance (in centimeters) between the thyroid notch and the mentum will be measured and recorded.

The ratio of height to thyromental distance (RHTMD)

The RHTMD was derived from the height and thyromental distance of the patient.

Neck circumference

neck circumference was measured (cm) at the level of thyroid cartilage.

Cormack–lehane classification

Four degrees of direct laryngoscopic views are distinguished based on the extent of laryngeal exposure. laryngoscopy was performed with the head in the sniffing position, and the laryngoscopic view was determined using the Cormack- Lehane grading system. The grades are Grade I-Visualisation of entire laryngeal aperture. Grade II-Visualisation of the posterior part of the laryngeal aperture. Grade III -Visualisation of only epiglottis. Grade IV-No glottis structures can be seen. Grade I and Grade II are considered easy intubation. Grade III and IV are considered to be difficult intubations.[9] Demographic parameters, including age, sex, height, and weight, were recorded for all patients.

Measurement of body mass index

BMI was calculated by using the following formula: BMI: m/h2, Where m= mass in kgs h= height in meters.[10]

Mallampati class

Airway assessment, according to Sampsoon's modification of mallampati classification, was done with an open mouth as wide as permissible without phonation and head in a neutral position, in sitting positions.

Thyromental distance (TMD)

The patients were asked to fully extend their neck and keep their mouth closed in an upright sitting position. Then, the distance between the laryngeal prominence of the thyroid cartilage and the mental protuberance of the mandible was measured by a ruler in cm.

The Ratio of height to thyromental distance (RHTMD)

The RHTMD was derived from the height and thyromental distance of the patient. Neck Circumference: neck circumference was measured (in cm) at the level of the thyroid cartilage in an upright sitting position.

Data analysis

The sample size was calculated based on a previous study by Sumer et al. (2019).[11] The study observed that the Modified Mallampati test has the highest sensitivity (75%) and specificity (92.05%) among all the other screening tests. Taking these values as a reference, the minimum required sample size with 80% power and a 5% level of significance is determined. Therefore, a minimum of 65 patients was required in the study, but considering the error and drop of 20%, the sample size was increased to 75. Categorical variables were presented in number and percentage (%), and continuous variables were presented as mean ± SD and median. The normality of the data was assessed using the Kolmogorov-Smirnov test. If the normality was rejected, then nonparametric tests were used. A p-value < 0.05 was considered statistically significant. The data were entered into an MS Excel spreadsheet and analyzed using SPSS version 22.0. To prevent instrumental bias, the same flexible measuring tape was used to measure four parameters prior to surgery: the modified Mallampati test, neck circumference, thyromental distance measurement, and height-to-thyromental distance ratio. A skilled anesthesiologist who has performed at least 20 pediatric intubations performed all pre-operative evaluations, direct laryngoscopies, and intubations.

Ethical approval

Ethical approval for the study was obtained by the Ethics Committee of Pandit Bhagwat Dayal Sharma University of Health Sciences (approval code EC/NEW/INST/2020/874). All participants were provided written informed consent before the study and had the right to withdraw from the study at any stage.

3. Results

Demographic parameters

Age

The minimum age was 8 years, and the maximum age was 14 years (mean age 10.32 ± 2.061 SD).

Weight

The minimum weight was 22 kgs, and the maximum was 62 kgs (mean weight 37.661 ± 7.1773 SD) 1.03828.

Height

The minimum height was 105 cm, and the maximum height was 166 cm (mean height 135.67 ± 10.054 SD).

BMI

The minimum BMI was 18.90kgm-2, and the maximum BMI was 22.90kgm-2 (mean BMI 20.41 ± 1.038 SD).

American society of anesthesiologists (ASA) grading

ASA Classification was done based on the patient's physical status. Out of 75 patients, 66 were classified as ASA class I, while nine were classified as ASA class II. 88% were ASA class I, and 12% were ASA class II. (Table 1)

Modified mallampati score

Out of 75 patients, 23 had MPG I (30.7%), 40 had MPG2 (53.3%), and 12 had MPG 3 (16%). None of them had Mallam-pati grade- 4 (Table 1).

Cormack lehane (CL) grade

Out of 75 patients, 20 had CL grade 1 (26.7%), 43 had CL grade 2 (57.3%), and 12 had CL grade 3 (16%). No patient had CL grade 4. (Table 1).

Anthropometric parameters

1. Thyromental Distance (TMT): minimum thyromental distance was 6 cm, and maximum thyromental distance was 7.5 cm (mean thyromental distance 6.82 ± 0.2578 SD).

2. Neck Circumference (NC): minimum neck circumference was 26 cm, and maximum neck circumference was 34 cm (mean 29.53 ± 1.7827 SD).

3. Ratio of height to thyromental distance (RHTMD): The minimum RHTMD was 17.50, and the maximum was 25.0 (mean RHTMD 19.86 ± 1.479 SD).

Correlation of parameters with laryngoscopic view as graded by Cormack Lehane:

MPG with CL grade

Out of 23 patients with MPG grade 1, 12 had CL grade 1, and 11 had CL grade 2. None of these patients had CL grade 3 or 4. Out of 40 patients with MPG grade 2, 8 had CL Grade 1, 30 had CL grade 2, and 2 had CL grade 3. None of these patients had CL grade 4. Out of 12 patients with MPG grade 3, 2 had CL grade 2, and 10 had CL grade 3. None of these patients had CL grade 1 or 4. (Table 1).

Table 1. Distribution of MPG and CL grade.

		CL Grade			Total
		1	2	3	
MPG	1	12	11	0	23
	2	8	30	2	40
	3	0	2	10	12
Total		20	43	12	75

P-value =0.001(S).

The diagnostic value of MPG classification was found to be significant, with a p-value of 0.001. It was observed that the sensitivity of MPG classification to predict difficult airway in children was 96.83% (95% CI= 89.00%- 99.61%), specificity was 83.33% (95% CI= 51.59% to 97.91%), positive predictive value was 96.83% (95% CI= 89.58% to 99.08%), negative predictive value was 83.33% (95% CI= 55.54% to 95.24%) and accuracy was 94.67% (95% CI= 86.90% to 98.53%). (Table 2).

Table 2. Diagnostic value of MPG.

Statistic	P-value	95% CI
Sensitivity	96.83%	89.00% to 99.61%
Specificity	83.33%	51.59% to 97.91%
Positive Predictive Value (*)	96.83%	89.58% to 99.08%
Negative Predictive Value (*)	83.33%	55.54% to 95.24%
Accuracy (*)	94.67%	86.90% to 98.53%

TMT with CL grade

A total of 63 patients had CL grades 1 and 2, out of which 5 had TMT cut-off values within the normal range. A total of 12 patients had CL grade 3, out of which 6 had CL values within the normal range. (Table 3).

Table 3. Diagnostic value of MPG.

		CL Grade		Total
		1+2	3	
TMT (CM)	Easy	5	6	11
	Difficult	58	6	64
Total		63	12	75

P-value=0.001(S).

The diagnostic value of TMT was found to be significant, with a p-value of 0.001. The sensitivity of this test was 92.06% (95% CI= 82.44% to 97.37%). The specificity of this test was 50.00% (95% CI= 21.09% to 78.91%). The positive predictive value was found to be 90.62% (95% CI= 84.53% to 94.48%). The negative predictive value was found to be 54.55% (95% CI, 30.34% to 76.78%) with a diagnostic accuracy of 85.33% (95% CI, 75.27% to 92.44%). (Table 4).

Table 4. Diagnostic value of TMT.

Statistic	P-value	95% CI
Sensitivity	92.06%	82.44% to 97.37%
Specificity	50.00%	21.09% to 78.91%
Positive Predictive Value (*)	90.62%	84.53% to 94.48%
Negative Predictive Value (*)	54.55%	30.34% to 76.78%
Accuracy (*)	85.33%	75.27% to 92.44%

Neck circumference with CL grade

A total of 63 patients had CL grades of 1 and 2, out of which 50 had neck circumference within the normal range. A total of 12 patients had a CL grade of 3, out of which 3 had neck circumferences within the normal range. (Table 5).

Table 5. Comparison of NC with CL grade.

		CL Grade		Total
		1+2	3	
NC(cm)	Easy	50	3	53
	Difficult	13	9	22
Total		63	12	75

P-value=0.001(S).

The diagnostic value of NC was found to be significant, with a p-value of 0.001. The sensitivity of this test was 79.37% (95% CI= 67.30% to 88.53%). The specificity of this test was 75% (95% CI 42.81% to 94.51%). The positive predictive value was found to be 94.34% (95% CI= 86.12% to 97.82%). 5. The negative predictive value was found to be 40.91% (95% CI= 27.85% to 55.39%) with diagnostic accuracy of 78.67% (95% CI= 67.68% to 87.29%). (Table 6).

Table 6. Diagnostic value of NC.

Statistic	P-value	95% CI
Sensitivity	79.37%	67.30% to 88.53%
Specificity	75.00%	42.81% to 94.51%
Positive Predictive Value	94.34%	86.12% to 97.82%
Negative Predictive Value	40.91%	27.85% to 55.39%
Accuracy	78.67%	67.68% to 87.29%

RHTMD with CL grade

A total of 63 patients had CL grades 1 and 2, out of which 62 had RHTMD within the normal range. A total of 12 patients had CL grade 3, out of which 8 had RHTMD within the normal range. (Table 7).

Table 7. Comparison of RHTMD with CL grade.

		CL Grade		Total
		1+2	3	
TMT (CM)	Easy	5	6	11
	Difficult	58	6	64
Total		63	12	75

P-value=0.001(S).

The diagnostic value of RHTMD was found to be significant, with a p-value of 0.001. The sensitivity of this test was 98.41% (95% CI= 91.47% to 99.96%). The specificity of this test was 33.33% (95% CI= 9.92% to 65.11%). The positive predictive value was found to be 88.57% (95% CI= 83.84% to 92.05%). The negative predictive value was found to be 80.00% (95% CI = 32.82% to 97.04%), with a diagnostic accuracy of 88% (95% CI = 78.44% to 94.36%). (Table 8).

Table 8. Diagnostic value of RHTMD.

Statistic	P-value	95% CI
Sensitivity	92.06%	82.44% to 97.37%
Specificity	50.00%	21.09% to 78.91%
Positive Predictive Value (*)	90.62%	84.53% to 94.48%
Negative Predictive Value (*)	54.55%	30.34% to 76.78%
Accuracy (*)	85.33%	75.27% to 92.44%

Cut-off values for TMT, NC, and RHTMD for the 8-14 years age group in our study were found by ROC curve analysis. The cut-off value for TMT was found to be 6.65 CM (AUC = 0.204). The cut-off value for NC was found to be 29.25 cm (AUC = 0.825). The cut-off value for RHTMD was found to be 20.25 CM (AUC = 0.850). (Table 9).

Table 9. ROC curve analysis for TMT, NC, and RHTMD.

	Area Under the Curve	Cut Off	P-value	Asymptomatic 95% Confidence Interval	
				Lower Bound	Upper Bound
TMT	0.204	6.65	0.001 (S)	0.054	0.354
NC	0.825	29.25	0.001 (S)	0.685	0.964
RHTMD	0.850	20.25	0.001 (S)	0.738	0.962

4. Discussion

Demographic parameters, including age, weight, height, BMI, and ASA grading, were examined. In our study, 30.7% of the study population had a Modified Mallampati score (MPS) of 1, 53.3% had an MPS of 2, and 16% had an MPS of 3. No patient had Mallampati grading.[4] The sensitivity of MPG was found to be 96.83%, with a specificity of 83.33%. It had a positive predictive value of 96.83% and a negative predictive value of 83.33% with diagnostic accuracy of 94.67%. These results were found to be statistically significant (p-value: 0.001). Our study results were comparable to those of Sumer et al.[11] who evaluated pediatric patients aged 5-12 years of either sex with a physical status of ASA 1-2, posted for elective surgery under general anesthesia, to assess difficult airways. Airway's objective was to evaluate the predictive value of the Cormack Lehane grade, which was derived from the modified Mallampati test (MMT), upper-lip-bite test (ULBT), thyromental distance (TMD), and Ratio of height to thyromental distance (RHTMD), in order to predict difficult airway, or difficult intubation, in pediatric patients aged 5 to 12. Among all the screening tests, the Modified Mallampati test demonstrated the best sensitivity (75%) and specificity (92.05%), according to this study. It also has a high positive predictive value (56.25%), negative predictive value (96.43%), and diagnostic accuracy (90%), with a p-value of <0.0001. This difference from our study may be due to inter-observer bias, as a single anaesthesiologist conducted our study. Inal et al., conducted a study comparing different tests to determine the difficulty of intubation in pediatric patients.[12] Two hundred fifty pediatric patients aged 5 to 11 years were included in the study. The sensitivity and specificity of the modified Mallampati test were 76.92% and 95.54%, while those for ULBT were 69.23% and 97.32%. The optimal cut-off point for the Ratio of height to thyromental distance and thyromental distance for predicting difficult laryngoscopy was 23.5 (sensitivity, 57.69%; specificity, 86.61%) and 5.5cm (sensitivity, 61.54%; specificity, 99.11%). The modified Mallampati was the most sensitive of the tests, which was comparable to our study (MMT p-value 0.001). Kilic et al. conducted a study in 48 pediatric patients aged 14 years or younger to predict difficult airways.[13] They included ULBT, MMT, and anthropometric measurements of the head and neck. They found out that the sensitivity of MMT was 83% and specificity was 78%. The difference may be explained by the fact that they excluded children under 5 years of age, as they did not follow the command and were unable to perform the test. Additionally, this study had a relatively small study population compared to ours in terms of Thyromental distance. In our study, the minimum thyromental distance was found to be 6 cm and the maximum 7.5 cm. The sensitivity of TMT was found to be 92.06%, with a specificity of 50%. It had a positive predictive value of 90.62% and a negative predictive value of 54.55%. These results were found to be statistically significant (p-value: 0.001). Most studies show that the minimum TMD in adults below which intubation is problematic is 6.5 cm. Although the lowest acceptable value for TMD in newborns and children is typically lower, there are no set values available due to racial and ethnic variations in the pediatric population. ROC curve analysis in our study revealed that the cut-off value for TMD was 6.6 cm. The results were comparable with that done by Sumer et al.,[11] in which the sensitivity of TMD was found to be 58.33%, the specificity - 65.90%, the positive predictive value -18.9%, negative predictive value - 92.06% and the diagnostic accuracy of TMD was found to be 65% with p-value <0.0001. The cut-off value for thyromental distance was found to be 6.3cm. Rafique N.B. et al. studied a 196-pediatric population and divided them into two groups: those above 5 years of age and those below. This study concluded that ease of intubation is related to an increase in thyromental distance. The wide variation in TMD values can be attributed to differences in anthropological measurements across various races and ethnicities, which are associated with ethnic variations in craniofacial configurations of populations. The differences in the results from our study may be attributed to variations in sample size and age group of the study population.

RHTMD

In our study, the minimum RHTMD was 17.5 cm, and the maximum was 25 cm. The sensitivity of RHTMD was found to be 98.41%, and specificity was 33.3%. The positive predictive value was 88.57%, and the negative predictive value was 80%, with diagnostic accuracy of 88%. These results were found to be statistically significant (p-value: 0.001). The cut-off value of RHTMD in our study was found to be 20.25 through ROC curve analysis. These results indicate that RHTMD is a helpful predictor of difficult airways in children, with a high likelihood of a difficult airway if the RHTMD value is below the cut-off point. Inal et al., found the optimal cut-off value of RHTMD to be 23.5, with a sensitivity of 57.69%, specificity of 86.61%, Positive Predictive Value of 48.6%, Negative predictive value of 90.3%, and diagnostic accuracy of 62.4%. The difference in outcomes from the present study may be due to differences in the sample size of the study population and differences in ethnicities.[12] Sumer et al.,[11] in their study, found out that the sensitivity of the Ratio of height to thyromental distance was 58.33%, the specificity was found to be 46.59%, the positive predictive value was found to be 12.96%, the negative predictive value was found to be 89.13%, and the diagnostic accuracy was found to be 48% with p-value <0.0001. It was observed that a cut-off value for 40 ratio of height to thyromental distance was 18 cm through ROC curve analysis. They concluded that RHTMD can predict difficult intubation, for which there are fewer chances of it being easy; however, if it predicts easy intubation, there may be a high chance of it being difficult. The diagnostic accuracy of this test was also lower than that of all the other tests in this study. The difference in the cut-off value in the present study may be due to variations in ethnicities, racial, and regional differences among the groups.

Neck circumference

In this study, the minimum length of neck circumference was found to be 17.5 cm, and the maximum was 25 cm. The cut-off value for neck circumference was found to be 29.25 cm through ROC curve analysis. The sensitivity of neck circumference was found to be 79.37%, and specificity was 75% with a positive predictive value of 94.4% and a negative predictive value of 40.91% with a diagnostic accuracy of 78.67%. These results were found to be statistically significant (p-value: 0.001). Our study revealed that if the neck circumference is within the normal cut-off value, there is a high chance of easy intubation. However, if it does not rule out a difficult airway, the negative predictive value is low. Our study aligns with the one conducted by Aggarwal et al., in which 100 pediatric patients aged 1-5 years were assessed. In this study, a statistically significant correlation was found between NC and the grade of mask ventilation (pre-paralysis p-value = 0.02, post-paralysis p-value = 0.002). Although the study population in this study had a different age group, it was also found to be statistically significant (p-value: 0.00).[14] To predict difficult airways in children, the modified Mallampati test is the most useful parameter for bedside screening in the 8- to 14-year-old age group, as it has high sensitivity and the highest diagnostic accuracy. Additionally, other tests, such as RHTMD, thyromental distance, and neck circumference, are equally reliable. However, RHTMD has high positive predictive value and negative predictive value with low specificity, as shown by our study. Managing a difficult airway in a pediatric patient is a challenging task that can be addressed through a thorough pre-operative assessment of airway parameters. In previous research, e.g., Sumer SS, pediatric patients aged 5-12 years of either sex with a physical status of ASA 1-2, posted for elective surgery under general anesthesia, were included to evaluate difficult airways. The aim was to 38 assess the value of the modified Mallampati test (MMT), upper-lip-bite test (ULBT), thyromental distance (TMD), and Ratio of height to thyromental distance (RHTMD) from which Cormack Lehane grade was derived to predict difficult airway i.e. difficult intubation in pediatric patients ranging from 5-12 years age. Our study aligns with the one conducted by Aggarwal et al., in which 100 pediatric patients aged 1-5 years were assessed. In this study, a statistically significant correlation was found between NC and the grade of mask ventilation (pre-paralysis p-value = 0.02, post-paralysis p-value = 0.002). Although the study population in this study had a different age group from ours, the finding was also statistically significant (p-value: 0.001).[14]

5. Conclusion

All four parameters, namely the modified Mallampati test, thyromental distance, Ratio of height to thyromental distance, and neck circumference, were found to be statistically significant in predicting difficult airways in children of age group 8-14 years. 3. 66 patients were of ASA class 1, and 9 patients were of ASA class 2. 4. Out of 4 parameters assessed, RHTMD had the highest sensitivity of 98.41%, followed by MPG with a sensitivity of 96.83%, suggesting that they are highly sensitive predictors, of difficult airway in children. 42 5. Thyromental distance had a sensitivity of 92.06%, while neck circumference had a sensitivity of 79.37%. 6. The positive predictive value of MPG was highest, i.e., 96.83%, followed by neck circumference with PPV of 94.34%, thyromental distance at 90.62%, and RHTMD with 88.57%, suggesting that if any of the four parameters is not within normal range, the probability of it being a difficult airway is high. 7. The negative predictive value of MPG was highest at 83.33%, followed by RHTMD at 80%, suggesting that if the patient has these parameters within the normal range, the probability of it being a difficult airway is low. 8. Negative predictive values of thyromental distance and neck circumference were 54.55% and 40.91%, respectively. It indicates that even if these parameters are within the normal range, the probability of it being a difficult airway cannot be ruled out. Based on this study, the Modified Mallampati test and the Ratio of height to thyromental distance are direct predictors of difficult airways in children aged 8-14 years, followed by thyromental distance and neck circumference. To predict difficult airways in children, the modified Mallampati test is the most useful parameter for bedside screening in the 8- to 14-year-old age group, as it has high sensitivity and the highest diagnostic accuracy. Additionally, other tests, such as RHTMD, thyromental distance, and neck circumference, are equally reliable. However, RHTMD has a high positive predictive value and negative predictive value but low specificity.

Conflict of Interest

The authors declared that there is no conflict of interest.

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