INDIAN ASSOCIATION OF EPIDEMIOLOGISTS

**Epidemiology International**
**Volume 10, Issue 1 - 2025, Pg. No. 4-11**
**Peer Reviewed & Open Access Journal**

**Research Article**

# A Comparative Study of Acromio-Axillo-Suprasternal Notch Index with Modified Mallampati Grading and Thyromental Distance in Predicting Difficult Visualization of Larynx

Vijay R[1], Pratima Kamareddy[2]

[1]Junior Resident, [2]Professor & HOD, Department of Anesthesiology, MR Medical College, Kalaburagi, Basaweshwara Teaching and General Hospital, Kalaburagi

**DOI:** https://doi.org/10.24321/2455.7048.2024011

## I N F O

**Corresponding Author:**
Vijay R, Department of Anesthesiology, MR Medical College, Kalaburagi, Basaweshwara Teaching and General Hospital, Kalaburagi
**E-mail Id:**
Vijayjjmmc@gmail.com
**Orcid Id:**
https://orcid.org/ 0009-0008-6998-186X

**How to cite this article:**
Vijay R, Kamareddy P. A Comparative Study of Acromio-Axillo-Suprasternal Notch Index with Modified Mallampati Grading and Thyromental Distance in Predicting Difficult Visualization of Larynx. Epidem Int. 2025;10(1):4-11.

Date of Submission: 2025-07-10
Date of Acceptance: 2025-08-20

## A B S T R A C T

*Introduction:* Difficult laryngoscopy and intubation pose significant risks in anaesthetic practice. Traditional airway assessment tools like Modified Mallampati Grading (MMG) and Thyromental Distance (TMD) show variable predictive accuracy. The Acromio-Axillo-Suprasternal Notch Index (AASI) is a newer anatomical index that evaluates upper thoracic and cervical alignment and may offer better prediction of difficult visualization of the larynx (DVL). This study compared AASI with MMG and TMD in predicting DVL.

*Materials and Methods:* A prospective observational study was conducted on 60 adult patients (18–60 years), ASA I and II, undergoing elective surgeries under general anaesthesia requiring endotracheal intubation. Preoperative assessment included AASI, MMG, and TMD. Cormack-Lehane grading during laryngoscopy served as the reference standard, with Grades III and IV defined as DVL. Statistical analysis included chi-square tests, logistic regression, and ROC curve analysis using SPSS v25.0.

*Results:* DVL was observed in 13.33% of patients. AASI ≥ 0.5 showed significant association with DVL ($\chi^2 = 24.53$, $p < 0.001$), and was an independent predictor ($\beta = 4.80$, $p = 0.0002$). AASI demonstrated sensitivity of 75%, specificity of 96%, accuracy of 93%, and AUC of 0.85. In contrast, TMD and MMG had lower sensitivities (25% and 50%, respectively) and were not statistically significant predictors ($p > 0.05$).

*Conclusion:* AASI outperformed MMG and TMD in predicting difficult laryngoscopy. Being simple, objective, and highly accurate, AASI should be considered for routine preoperative airway assessment.

**Keywords:** Difficult laryngoscopy, Airway assessment, Acromio-Axillo-Suprasternal Notch Index, Modified Mallampati Grading, Thyromental Distance, Predictive Indices, Cormack-Lehane Grading, Intubation Difficulty

## Introduction

Airway management is a cornerstone of anaesthetic practice, crucial for preventing life-threatening complications such as hypoxia, brain injury, and cardiac arrest, especially during anaesthesia induction or emergencies.[1,2] Anticipating a difficult airway enables anaesthesiologists to implement appropriate strategies for safe airway control.Difficult visualization of the larynx (DVL) significantly contributes to failed or prolonged intubations, with its reported incidence ranging from 0.1% to 20.2%, varying by population and definitions used.[3–5] This challenge is amplified in emergency and ICU settings due to patient instability and anatomical variations.[6] Several bedside tests are used for preoperative airway assessment, including the Modified Mallampati Classification, thyromental distance (TMD), inter-incisor distance, and upper lip bite test.[7,8] Though these are simple and cost-effective, their predictive accuracy varies, and no single method consistently demonstrates high sensitivity and specificity.[9–11] Clinical observations suggest that features like short necks, sloped clavicles, and bulky shoulders—often overlooked by conventional methods—can contribute to difficult laryngoscopy. Ezri et al. introduced the Acromio-Axillo-Suprasternal Notch Index (AASI), which accounts for upper chest and neck configuration by measuring the portion of the acromion-to-axilla line lying above the suprasternal notch in a supine patient.[11,12] Higher AASI values (>0.5) suggest restricted glottic visualization due to thoracic anatomy.Preliminary findings indicate AASI may outperform traditional predictors in sensitivity and specificity,[12] but its applicability in diverse populations, such as Indians, remains underexplored. Variations in cephalometric and airway anatomy across ethnic groups highlight the need for localized validation.[13] Traditional tests like the Mallampati classification are subjective and influenced by patient cooperation, while TMD is affected by head position and fails to assess other anatomical domains.[13,14] The upper lip bite test may not be feasible in certain clinical scenarios like edentulous patients.[15] AASI, being objective, cooperation-independent, and anatomically inclusive, may offer a superior alternative.[13,14] However, comparative evaluations with established predictors in Indian populations are limited.

Hence, this study aims to assess the predictive value of AASI versus Modified Mallampati Grading and TMD for difficult laryngoscopy. The goal is to validate AASI as a reliable, simple, and reproducible tool for airway assessment in Indian clinical settings, potentially improving anaesthetic planning and patient safety.

## Materials and Methods

This prospective observational study was conducted in the Department of Anaesthesiology at Basaweshwara Teaching and General Hospital, affiliated with Mahadevappa Rampure Medical College, Kalaburagi, Karnataka. A total of 60 patients scheduled for elective surgeries under general anaesthesia with endotracheal intubation were enrolled through purposive sampling.

## Inclusion and Exclusion Criteria

Eligible participants were aged 18 to 60 years, classified as ASA physical status I or II, and undergoing elective surgery requiring endotracheal intubation under general anaesthesia. Patients with anatomical abnormalities or upper airway pathology (e.g., tumors, fractures), those with recent head or neck surgery, or those unable to open the mouth were excluded.

### Study Procedure

All eligible patients were evaluated preoperatively using three standardized airway assessment tools: Acromio-Axillo-Suprasternal Notch Index (AASI), Modified Mallampati Grading (MMP), and Thyromental Distance (TMD). For the AASI measurement, patients were placed in the supine position with their arms resting at their sides. A vertical line (Line A) was drawn from the acromion to the superior border of the axilla at the level of the pectoralis major muscle. A perpendicular line (Line B) was drawn from the suprasternal notch to intersect Line A. The segment of Line A above the intersection with Line B was designated as Line C. AASI was calculated as the ratio of C to A (C/A), and a value greater than 0.5 was considered predictive of difficult laryngoscopy. For the Modified Mallampati Grading, patients were examined in the seated position with their mouth open and tongue protruded without phonation. The oropharyngeal structures were classified into four classes: Class I – soft palate, fauces, uvula, and pillars visible; Class II – soft palate, fauces, and uvula visible; Class III – soft palate and base of uvula visible; Class IV – only hard palate visible. The TMD was measured as the straight distance from the mentum to the thyroid notch with the neck fully extended, and a value less than 6.5 cm was taken as a marker for potential difficult laryngoscopy. All airway assessments were performed preoperatively by the same anaesthesiologist to reduce interobserver variability.

## Anaesthetic Protocol and Laryngoscopy Assessment

All patients received standard premedication comprising intravenous midazolam at a dose of 0.05 mg/kg and glycopyrrolate 0.2 mg. Induction of anaesthesia was achieved using intravenous propofol (2 mg/kg) and fentanyl (2 µg/kg), followed by vecuronium (0.1 mg/kg) for neuromuscular blockade. Laryngoscopy was performed with the patient in the sniffing position, using a Macintosh blade No. 3, after ensuring adequate muscle relaxation confirmed by the disappearance of the fourth twitch in a train-of-four (TOF) stimulation. An experienced anaesthesiologist,

**ISSN: 2455-7048**
**DOI: https://doi.org/10.24321/2455.7048.2024011**

who was blinded to the results of the preoperative airway assessments, performed all laryngoscopies. The Cormack-Lehane grading system was used to classify the laryngeal view: Grade I – full view of the glottis; Grade II – partial view of the glottis with the anterior commissure not visible; Grade III – only the epiglottis visible; Grade IV – neither glottis nor epiglottis visible. Grades I and II were classified as Easy Visualization of the Larynx (EVL), and Grades III and IV were considered Difficult Visualization of the Larynx (DVL). In cases where DVL was encountered, laryngoscopy was repeated using a Macintosh blade No. 4 and appropriate optimization techniques, including external laryngeal manipulation, were employed.

## Ethical Considerations

Before enrollment, written informed consent was obtained from all participants in their vernacular language after explaining the study's nature, purpose, and procedures. Confidentiality of patient information was strictly maintained, and all protocols adhered to institutional ethical guidelines and the Declaration of Helsinki principles.

## Statistical Analysis

Data were analyzed using IBM SPSS Statistics version 25. Continuous variables were summarized as mean ± SD, and categorical variables as frequencies and percentages. The chi-square test assessed associations between airway predictors (AASI, TMD, MMP) and DVL. Independent t-tests compared continuous variables between easy and difficult laryngoscopy groups. Logistic regression identified independent predictors, while ROC curve analysis evaluated diagnostic accuracy using AUC. A p-value $< 0.05$ was considered significant. Among the parameters, AASI $\geq 0.5$ was a significant independent predictor of DVL ($\beta = 4.80$, $p = 0.0002$), with the highest diagnostic accuracy (AUC = 0.85), outperforming TMD and MMP.

ResultsA total of 60 patients scheduled for elective surgical procedures under general anaesthesia were enrolled in this prospective observational study. The demographic analysis revealed that the mean age of the study population was 34.50 years with a standard deviation of 14.22, indicating a predominantly young study with moderate variability. A majority of the patients (66.67%) were within the age group of 18–37 years, followed by 28.33% in the 38–57 years group, and only 5% were older than 58 years. Gender distribution demonstrated a slight predominance of female patients, who constituted 53.33% of the study population compared to 46.67% males.The clinical diagnoses among the patients were varied, with chronic suppurative otitis media (CSOM) of both right and left ears being the most frequently encountered condition, accounting for 33.32% of all cases. This was followed by lumbar disc pathology, particularly at the L4–L5 level, which was observed in 13.33% of patients. Other notable diagnoses included deviated nasal septum (10%), cholelithiasis (8.33%), chronic pancreatitis (5%), pseudocyst of the pancreas, and rectal prolapse (3.33% each), while rare conditions like L2-L3 disc bulge with sciatica and L5-S1 paracentral disc extrusion were each seen in 1.66% of the study participants. In terms of surgical procedures, tympanoplasty emerged as the most commonly performed operation, accounting for 30% of all surgeries. Other frequently performed procedures included submucosal resection (11.66%) and laparoscopic cholecystectomy (10%). Discectomy, endoscopic microdiscectomy, and other spine-related surgeries comprised a notable portion of the surgical spectrum. Overall, the surgical distribution reflected a predominance of ENT and spinal surgeries in this patient study.Evaluation of ASA physical status classification revealed that 66.67% of patients belonged to ASA Grade I, indicating a healthy status with no systemic disease, while 33.33% were categorized as ASA Grade II, reflecting the presence of mild systemic disease. This distribution highlights that the majority of participants were relatively healthy, with only a minority having minor comorbidities.

Assessment of metabolic and hematological parameters showed that the mean Body Mass Index (BMI) was 23.75 ± 12.35 kg/m², which falls within the normal range, although the high standard deviation suggests substantial inter-individual variability in body composition. The mean hemoglobin level was 11.72 ± 4.22 g/dL, indicating a tendency toward anemia among some individuals. The mean random blood sugar (RBS) level was 99.93 ± 25.26 mg/dL, reflecting overall normal glycemic status in the population. Vital parameters measured preoperatively included a mean pulse rate of 84.10 ± 18.36 beats per minute, respiratory rate of 15.95 ± 2.33 breaths per minute, and mean arterial pressure (MAP) of 91.40 ± 28.35 mmHg. These values suggest general stability in vital signs, though the relatively wide standard deviations point to variability among patients.Airway assessment revealed that the mean Thyromental Distance (TMD) was 7.11 ± 2.36 cm. Line A, representing the vertical measurement from the acromion to the superior axillary border, had a mean of 9.92 ± 1.36 cm, while Line C, the portion of Line A above the suprasternal notch, had a mean of 4.06 ± 1.98 cm. The mean Acromio-Axillo-Suprasternal Notch Index (AASI), calculated as the ratio of Line C to Line A, was 0.40 ± 0.32. According to the predefined threshold, 86.67% of patients had an AASI value ≤ 0.5, indicating a potentially easy airway, whereas 13.33% had a value > 0.5, suggesting a potentially difficult airway. Mallampati classification showed that 41.67% of patients were graded as Class I, 38.33% as Class II, and 20% as Class III. In terms of TMD categorization, 90% of patients had a measurement > 6.5 cm, while 10% had a TMD ≤ 6.5 cm.Laryngoscopic grading based on the

**ISSN: 2455-7048**
**DOI: https://doi.org/10.24321/2455.7048.2024011**

Cormack-Lehane (CL) system revealed that 50% of patients had a Grade I view, 33.66% had Grade II, and 13.34% had Grade III. Grades I and II were considered indicative of Easy Visualization of the Larynx (EVL), while Grade III and above were categorized as Difficult Visualization of the Larynx (DVL).In evaluating the diagnostic accuracy of the three airway assessment tools, AASI demonstrated the highest performance. It showed a sensitivity of 75%, specificity of 96%, positive predictive value (PPV) of 75%, negative predictive value (NPV) of 96%, and an overall diagnostic accuracy of 93%. The area under the curve (AUC) for AASI was 0.85, reflecting excellent discriminative ability. In contrast, TMD had a low sensitivity of 25% but high specificity of 92%, with an accuracy of 83% and AUC of 0.58. Mallampati grading showed intermediate values with 50% sensitivity, 85% specificity, 80% accuracy, and an AUC of 0.67. These results highlight the superior predictive value of AASI compared to the conventional methods.Chi-square analysis revealed a highly significant association between AASI and difficult laryngoscopy ($\chi^2 = 24.53$, $p < 0.001$), affirming its strong predictive capability. However, no statistically significant associations were observed for TMD ($p = 0.38$) or Mallampati grading ($p = 0.43$), indicating that these parameters may have limited value as standalone predictors.Logistic regression analysis further confirmed the predictive utility of AASI. An AASI value ≥ 0.5 was found to be a statistically significant independent predictor of DVL, with a regression coefficient (β) of 4.80 (95% CI: 2.26–7.34), z-value of 3.71, and a p-value of 0.0002. TMD < 6.5 cm, although showing a positive coefficient of 2.51, was not statistically significant ($p = 0.0855$), and Mallampati grading > Class II also did not emerge as a significant predictor ($\beta = 0.47$, $p = 0.6031$). These findings establish that among the three parameters studied, AASI had the highest predictive value and statistical reliability in identifying difficult visualization of the larynx. Consequently, AASI appears to be a valuable and robust tool in preoperative airway assessment and should be considered in clinical practice to enhance patient safety during anaesthesia.

**Table 1.Baseline Demographic and Clinical Characteristics of Study Population**

n = 60

| Parameter | Mean ± SD / Frequency (n) | Percentage (%) |
|---|---|---|
| Age (years) | 34.50 ± 14.22 | — |
| Age Group 18–37 | 40 | 66.67 |
| Age Group 38–57 | 17 | 28.33 |
| Age Group > 58 | 03 | 05.00 |
| **Gender** | | |
| Male | 28 | 46.67 |
| Female | 32 | 53.33 |
| **ASA Classification** | | |
| ASA I | 40 | 66.67 |
| ASA II | 20 | 33.33 |
| BMI (kg/m²) | 23.75 ± 12.35 | — |
| Hemoglobin (g/dL) | 11.72 ± 4.22 | — |
| Random Blood Sugar (mg/dL) | 99.93 ± 25.26 | — |
| Mean Arterial Pressure (mmHg) | 91.40 ± 28.35 | — |

**Table 2.Airway Assessment and Laryngoscopy Findings**

| Parameter | Mean ± SD / Frequency (n) | Percentage (%) |
|---|---|---|
| Thyromental Distance (cm) | 7.11 ± 2.36 | — |
| TMD > 6.5 cm | 54 | 90.00 |
| TMD ≤ 6.5 cm | 06 | 10.00 |
| AASI > 0.5 | 08 | 13.33 |
| AASI ≤ 0.5 | 52 | 86.67 |
| **Mallampati Classification** | | |
| Class I | 25 | 41.67 |

**ISSN: 2455-7048**
**DOI: https://doi.org/10.24321/2455.7048.2024011**

| | | |
|---|---|---|
| Class II | 23 | 38.33 |
| Class III | 12 | 20.00 |
| **Cormack-Lehane Grade** | | |
| Grade I | 30 | 50.00 |
| Grade II | 22 | 33.66 |
| Grade III | 08 | 13.34 |

**Table 3.Comparative Diagnostic Performance of Airway Predictors for Difficult Visualization of Larynx (DVL)**

| Parameter | Sensitivity (%) | Specificity (%) | PPV (%) | NPV (%) | Accuracy (%) | AUC |
|---|---|---|---|---|---|---|
| AASI > 0.5 | 75 | 96 | 75 | 96 | 93 | 0.85 |
| TMD ≤ 6.5 cm | 25 | 92 | 33 | 89 | 83 | 0.58 |
| Mallampati > II | 50 | 85 | 35 | 92 | 80 | 0.67 |

## Discussion

This prospective observational study was undertaken to evaluate and compare the predictive performance of the Acromio-Axillo-Suprasternal Notch Index (AASI) with the Modified Mallampati Grading (MMG) and Thyromental Distance (TMD) in assessing the likelihood of difficult visualization of the larynx (DVL) during laryngoscopy in adult patients undergoing elective surgeries under general anaesthesia. Sixty adult patients aged between 18 and 60 years, belonging to ASA physical status I and II, were assessed preoperatively using the three indices, and the laryngoscopic view was classified using the Cormack-Lehane grading system.

The demographic profile of our study population revealed a predominantly younger study with a mean age of 34.50 ± 14.22 years, and most participants (66.67%) were within the 18–37 year age range. These findings closely correspond with the study by Chitralekha and Vishwanath,[16] who reported a similar mean age of 34.28 ± 12.74 years, and also with studies by Das et al.[17] and Kamranmanesh et al.[18] who found mean ages of 35.9 ± 13.2 years and 36.8 ± 13.1 years, respectively. These consistencies highlight that such studies are commonly conducted in relatively young adult populations, likely due to their suitability for elective procedures and standardized airway evaluation.

Gender distribution in our study showed a slight predominance of female participants (53.33%), which was nearly balanced with male participants (46.67%). This is in concordance with the study by Anjali et al.,[19] which reported an identical gender distribution. Other studies such as those by Kamranmanesh et al.[18] and Das et al.[17] reported minor variations in gender representation but concluded that gender did not significantly affect the predictive value of airway assessment indices, including AASI, a conclusion also supported by our results.

The diagnostic profile of patients in our study revealed a high prevalence of ENT conditions, with chronic suppurative otitis media (CSOM) accounting for 33.32% of the cases, followed by lumbar disc pathology (13.33%), deviated nasal septum (10%), and other abdominal conditions. Similar patterns were observed in studies by Chitralekha and Vishwanath[16] and Anjali et al.[19] where ENT and spinal conditions predominated, reinforcing the relevance of anatomical indices like AASI in populations with potential limitations in neck mobility and thoraco-cervical anatomy.

Surgical procedures in our study mirrored the diagnostic distribution, with tympanoplasty being the most frequent (30%), followed by SMR (11.66%) and laparoscopic cholecystectomy (10%). This pattern was consistent with the surgical distribution reported by Chitralekha and Vishwanath,[16] Acharya et al.[20] and Das et al.[17] who also noted a predominance of ENT and spine-related surgeries among their study populations. These similarities strengthen the external validity of our findings and support the use of AASI in these patient groups.

The ASA physical status classification in our study revealed that 66.67% of patients were ASA I and 33.33% were ASA II, indicating a predominantly healthy population with minimal comorbidities. This distribution closely aligns with studies by Chitralekha and Vishwanath,[16] Acharya et al.[20] and Anjali et al.[19] all of whom also included ASA I and II patients exclusively. This homogeneity is essential, as systemic illnesses could confound the anatomical assessment of airway predictors like AASI.

Metabolic and hematological parameters in our study revealed a mean BMI of 23.75 ± 12.35, hemoglobin of 11.72 ± 4.22 g/dL, and random blood sugar of 99.93 ± 25.26 mg/dL, consistent with findings by Chitralekha and Vishwanath,[16] who reported a mean BMI of 22.43 ± 2.3. These results suggest a generally healthy and nutritionally adequate study, which reduces potential biases related to

**ISSN: 2455-7048**
**DOI: https://doi.org/10.24321/2455.7048.2024011**

body habitus in airway assessment. Similarly, our baseline vital signs (pulse rate: 84.10 ± 18.36 bpm, MAP: 91.40 ± 28.35 mmHg) were comparable to those reported in previous studies, including Chitralekha and Vishwanath.[16]

With respect to anatomical airway indices, the mean TMD in our study was 7.11 ± 2.36 cm, which was similar to the values reported by Chitralekha and Vishwanath[16] (6.85 ± 0.74 cm), Anjali et al.[19] (6.90 ± 0.68 cm), and Kumar et al.[23] (6.80 ± 0.90 cm). Although TMD was previously considered a reliable indicator, our findings and those from the literature confirm that it lacks sensitivity and should ideally be complemented by other indices for better predictive accuracy.

In terms of Mallampati grading, most patients fell into Class I (41.67%) and II (38.33%), with only 20% in Class III. This distribution is in close agreement with Anjali et al.[19] who reported 39.5%, 36.7%, and 23.8% in Classes I, II, and III respectively, and with Das et al.[17] who found a distribution of 42%, 40%, and 18% respectively. While Mallampati grading remains a common and easy bedside test, its predictive limitations have been consistently demonstrated across studies, including ours.

The AASI assessment in our study showed that 86.67% of patients had AASI ≤ 0.5 and 13.33% had AASI > 0.5, indicating that a relatively small subset may be at risk for DVL. These findings are closely aligned with Suryawanshi and Bhatia[21] (≤0.5 in 87.5%, >0.5 in 12.5%), Acharya et al.[20] (≤0.5 in 85.4%), and Chitralekha and Vishwanath[16] (≤0.5 in 84%). The strong association between AASI > 0.5 and difficult laryngoscopy in these studies, along with our findings, reinforces the clinical utility of AASI.

Similarly, TMD categorization in our study revealed that 90% had TMD > 6.5 cm and only 10% had TMD ≤ 6.5 cm. Studies by Sen et al.[22] Chitralekha and Vishwanath,[16] and Kumar et al.[23] also demonstrated that patients with TMD ≤ 6.5 cm had a higher likelihood of difficult laryngoscopy, though the sensitivity of TMD alone remained low, confirming our observations.

Cormack-Lehane grading in our study revealed that 50% of patients were Grade I, 33.66% Grade II, and 13.34% Grade III. These values correspond closely to those reported by Suryawanshi et al.[24] Chitralekha and Vishwanath [16], and Anjali et al.[19] further validating the generalizability of our results and the prevalence of Grade III visualization in approximately 10–15% of elective surgical populations.

The diagnostic performance analysis in our study revealed that AASI had the highest sensitivity (75%), specificity (96%), and accuracy (93%), with an AUC of 0.85. In contrast, TMD had a sensitivity of 25%, specificity of 92%, and accuracy of 83%, with an AUC of 0.58. Mallampati grading showed intermediate performance (sensitivity: 50%, specificity: 85%, accuracy: 80%, AUC: 0.67). These findings are highly consistent with those of Suryawanshi et al.[24] (AASI sensitivity: 73.3%, specificity: 95.2%, accuracy: 92.5%, AUC: 0.84), Chitralekha and Vishwanath[16] (sensitivity: 70%, specificity: 93.3%, accuracy: 91.3%, AUC: 0.86), and Acharya et al.[20] (sensitivity: 72%, specificity: 94%). Our study therefore confirms AASI as the most accurate and discriminative predictor among the three indices.

The association analysis using chi-square tests confirmed a statistically significant correlation between AASI and DVL ($\chi^2 = 24.53$, $p < 0.001$), whereas TMD ($p = 0.38$) and Mallampati grading ($p = 0.43$) did not show significant associations. These results match the findings of Nandini et al.,[25] Anjali et al.[19] and Acharya et al.,[20] all of whom observed that AASI had statistically significant associations with Cormack-Lehane grading and difficult laryngoscopy, unlike the other two indices.

Logistic regression in our study further confirmed AASI as a statistically significant independent predictor of DVL ($\beta = 4.80$, $p = 0.0002$, 95% CI: 2.26–7.34). In contrast, TMD < 6.5 cm ($p = 0.0855$) and Mallampati > III ($p = 0.6031$) did not emerge as significant predictors. Similar logistic regression findings have been reported by Suryawanshi et al.[24] Nandini et al.[25] and Anjali et al.[19] reinforcing that AASI should be considered a robust standalone tool in predicting difficult laryngoscopy. Given its high specificity and accuracy, it can be confidently integrated into preoperative airway evaluation protocols, particularly in elective surgical populations. While TMD and Mallampati may offer supportive value when used in combination, AASI alone provides superior predictive accuracy, justifying its routine clinical application in airway assessment.

## Conclusion

This prospective observational study demonstrated that the Acromio-Axillo-Suprasternal Notch Index (AASI) is a highly accurate and reliable predictor of difficult visualization of the larynx (DVL) during direct laryngoscopy. AASI ≥ 0.5 showed excellent sensitivity (75%), specificity (96%), diagnostic accuracy (93%), and strong statistical significance ($p < 0.001$), making it a superior independent predictor compared to Thyromental Distance (TMD) and Modified Mallampati Grading. While TMD and Mallampati showed limited predictive utility when used alone, AASI, being simple and non-invasive, can be effectively incorporated into routine preoperative airway assessments to enhance patient safety.

### Limitations of the Study

This study had several limitations. First, the small sample size (n=60) may limit the generalizability of the results, and a larger multicentric study would enhance external validity. Second, being a single-center study, the findings

**ISSN: 2455-7048**
**DOI: https://doi.org/10.24321/2455.7048.2024011**

may not reflect diverse populations across different regions. Third, although a single anesthesiologist performed all assessments to reduce variability, the potential for observer bias, particularly in subjective tests like Mallampati grading, remains. Additionally, the use of different patient positions—seated for Mallampati and supine for AASI—may have introduced comparative variability. Lastly, the study did not evaluate long-term clinical outcomes such as intubation attempts, duration, or perioperative complications.

## References

1. Safavi M, Honarmand A, Zare N. A comparison of the ratio of patient's height to thyromental distance with the modified Mallampati and the upper lip bite test in predicting difficult laryngoscopy. Saudi J Anaesth. 2011;5(3):258–63.
2. Arne J, Descoins P, Fusciardi J, Ingrand P, Ferrier B, Boudigues D, et al. Preoperative assessment for difficult intubation in general and ENT surgery: predictive value of a clinical multivariate risk index. Br J Anaesth. 1998;80(2):140–6.
3. Rose DK, Cohen MM. The airway: problems and predictions in 18,500 patients. Can J Anaesth. 1994;41(5 Pt 1):372–83.
4. Langeron O, Masso E, Huraux C, Guggiari M, Bianchi A, Coriat P, et al. Prediction of difficult mask ventilation. Anesthesiology. 2000;92(5):1229–36.
5. Oates JD, Macleod AD, Oates PD, Pearsall FJ, Howie JC, Murray JD. Comparison of two methods for predicting difficult intubation. Br J Anaesth. 1991;66(3):305–9.
6. Rocke DA, Murray WB, Rout CC, Gouws E. Relative risk analysis of factors associated with difficult intubation in obstetric anesthesia. Anesthesiology. 1992;77(1):67–73.
7. Frerk CM. Predicting difficult intubation. Anaesthesia. 1991;46(12):1005–8.
8. Samsoon GL, Young JR. Difficult tracheal intubation: a retrospective study. Anaesthesia. 1987;42(5):487–90.
9. Shiga T, Wajima Z, Inoue T, Sakamoto A. Predicting difficult intubation in apparently normal patients: a meta-analysis of bedside screening test performance. Anesthesiology. 2005;103(2):429–37.
10. Khan ZH, Mohammadi M, Rasouli MR, Farrokhnia F, Khan RH. The diagnostic value of the upper lip bite test combined with sternomental distance, thyromental distance, and interincisor distance for prediction of easy laryngoscopy and intubation: a prospective study. AnesthAnalg. 2009;109(3):822–4.
11. Huh J, Shin HY, Kim SH, Yoon TK, Kim DK. Diagnostic predictor of difficult laryngoscopy: the hyomental distance ratio. AnesthAnalg. 2009;108(2):544–8.
12. Koh LK, Kong CE, Ip-Yam PC. The modified Cormack-Lehane score for the grading of direct laryngoscopy: Evaluation in the Asian population. Anaesth Intensive Care. 2002;30:48–51.
13. Madhu KP, Rajur S, Yathish, Nethra SS. Role of Acromioaxillosuprasternal Notch Index (AASI) as a new predictor of difficult visualization of larynx in comparison with Modified Mallampati Test. Indian J AnaesthAnalg. 2021;8(3):666–70.
14. Honarmand A, Hirmanpour A, Zareian N. Acromio-axillo-suprasternal notch index: A new screening test to predict difficult laryngoscopy in obstetric patients scheduled for caesarean delivery. Eur J Anaesthesiol. 2016;33(8):596–8. doi:10.1097/EJA.0000000000000437.
15. StatPearls. Anatomy, Head and Neck, Larynx Vocal Cords [Internet]. [cited 2025 Apr 4]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK535342/NCBI+1NCBI+1
16. Chitralekha X, Vishwanath G S. A Prospective Observational Study Comparing Acromio-Axillo-Suprasternal Notch Index with Modified Mallampatti Class and Neck Circumference / Thyromental Distance Ratio in Predicting Difficult Visualisation of Larynx. International Journal of Science and Research (IJSR). 2021 Jun 27;10(6):1146–9.
17. Das D, Rajkhowa T, Saikia P. An observational prospective study of performance of acromioaxillosuprasternal notch index in predicting difficult visualisation of the larynx. Indian Journal of Anaesthesia [Internet]. 2018 [cited 2022 Sep 9];62(12):945.
18. Kamranmanesh MR, Jafari AR, Gharaei B, Aghamohammadi H, Poor Zamany NKM, Kashi AH. Comparison of acromioaxillosuprasternal notch index (a new test) with modified Mallampati test in predicting difficult visualization of larynx. Acta Anaesthesiol Taiwan. 2013;51(4):141–4. doi:10.1016/j.aat.2013.12.001.
19. Anjali Peeceeyen S, Balakrishnan R, Thomas R. Comparison of acromio axillary sternal notch index, thyromental height test, and modified mallampati test in preanesthetic prediction of difficult laryngoscopy. Trends in Anaesthesia and Critical Care. 2022 Sep 17;47:7–12.
20. Acharya S, Sardesai S, Chavan P, Holkar V. acromio-axillo-suprasternal notch index [aasi] : a screening method to predict difficult laryngoscopy in patient undergoing general anaesthesia and requiring endotracheal intubation. international journal of advanced research [internet]. 2021 Oct 31 [cited 2022 Sep 9];9(10):717–21.
21. Suryawanshi CM, Bhatia J. Acromio-Axillo-Suprasternal Notch Index Performance in Predicting Difficult Visualization of the Larynx: An Observational Prospective Study. Cureus. 2024 Aug 12;(1):4-9.
22. Sen B, Mitra M, Kundu K, Basu M. Diagnostic Accuracy of Modified Mallampati Test (MMP) and Thyromental Distance Test (TMD) in Predicting Difficult Laryngos-

**ISSN: 2455-7048**
**DOI: https://doi.org/10.24321/2455.7048.2024011**

copyA Comparative Study in a Tertiary Care Teaching Hospital in India. Journal of Evidence Based Medicine and Healthcare. 2020 Jul 13;7(28):1379–84.

23. Kumar D, Bhargava S, Sisodiya RS, Tiwari D. A Comparison of Wilson Risk Sum Score and Combination of Modified Mallampati Classification, Hyomental Distance Ratio, Ratio of Height to Sternomental and Thyromental Distances for Predicting Difficult Laryngoscopy in Indian Population. Journal of Evidence Based Medicine and Healthcare. 2020 Dec 14;7(50):3038–45.
24. Suryawanshi CM, Bhatia J. Acromio-Axillo-Suprasternal Notch Index Performance in Predicting Difficult Visualization of the Larynx: An Observational Prospective Study. Cureus. 2024 Aug 12;(1):4-9.
25. None Nandini CV, Mohan N, None Deeksha BG, Kumar NS, None Harsoor SS. Comparison of acromio-axillo-suprasternal notch index with thyromental height test to predict difficult visualization of larynx. Asian Journal of Medical Sciences. 2024 Sep 2;15(9):8–14.

**ISSN: 2455-7048**
**DOI: https://doi.org/10.24321/2455.7048.2024011**