Original Research

A COMPARATIVE ANALYSIS OF MALLAMPATI GRADING IN SITTING AND SUPINE POSITIONS FOR DIFFICULT INTUBATION

Dr. Deeshna A.[1], Dr. Peter Engti[2], Dr. Biswajit Talukdar[3], Dr. Karuna Kumar Das[4], Dr. Arindam Phukan[5]

[1]Junior Consultant, Department of Anaesthesiology and Critical Care, Peerless Hospital, Guwahati, Assam, India.
[2]Assistant Professor, Department of Anaesthesiology, Diphu Medical College and Hospital, Diphu, Assam, India.
[3]Associate Professor, Department of Anaesthesiology, Gauhati Medical College, Guwahati, Assam, India.
[4]Professor, Department of Anaesthesiology, Assam Medical College and Hospital, Dibrugarh, Assam, India.
[5]Assistant Professor, Department of Anaesthesiology, Assam Medical College and Hospital, Dibrugarh, Assam, India.
Corresponding Author: Dr. Biswajit Talukdar,
Associate Professor, Department of Anaesthesiology and Critical Care, Gauhati Medical College, Guwahati, Assam, India.

ABSTRACT

Background: The Mallampati grading (MPG) system is commonly used to predict difficult intubation and is traditionally assessed in the sitting position, whereas intubation is usually performed in the supine position.

Objective: To compare the diagnostic accuracy of Mallampati grading in sitting and supine positions, correlate findings with Cormack-Lehane laryngoscopic grades, and evaluate the applicability of supine assessment in predicting difficult airway.

Methods: This prospective observational study included 100 patients undergoing elective surgery requiring endotracheal intubation. Mallampati grading was performed preoperatively in both sitting and supine positions. Intubation was carried out by an experienced anaesthesiologist blinded to the Mallampati scores. Difficult intubation was assessed using the Cormack-Lehane classification.

Results: Mallampati grades were generally higher in the supine position, suggesting increased detection of difficult airway. A significant correlation was observed between Mallampati grading and Cormack-Lehane grade in both positions ($p<0.001$). The predictive accuracy, based on the area under the ROC curve, was higher in the supine position compared to the sitting position. Higher supine Mallampati grades were associated with a significantly increased risk of difficult intubation.

Conclusion: Mallampati grading in the supine position demonstrates superior predictive accuracy compared to the sitting position. Incorporating supine assessment into routine preoperative airway evaluation may improve the prediction of difficult intubation and enhance patient safety.

Keywords: Supine Positions, Tracheal Intubation, Sitting Position.

INTRODUCTION

During general anaesthesia, the primary responsibility of an anaesthesiologist is to maintain a patent airway and ensure effective mechanical ventilation. This ensures continuous oxygen delivery and effective carbon dioxide removal while the patient is unconscious. Intubation is a vital aspect of anaesthesia management, ensuring patient safety and comfort during surgery. Failed tracheal intubation is defined as the inability to achieve successful intubation after a maximum of three attempts, irrespective of the technique used [1]. The most recent guidelines for managing unanticipated difficult or failed intubation were issued by the Difficult Airway Society in 2015 [2,3].

According to the American Society of Anaesthesiologists, a difficult airway is a clinical situation in which a trained anaesthesiologist has difficulty with facemask ventilation, laryngoscopy, tracheal intubation, extubation, use of supraglottic airway devices, or invasive airway access [4]. These situations may arise from factors such as anatomical abnormalities, limited mouth opening, poor visualization of the vocal cords, or technical limitations. Early identification of a potentially difficult airway is essential to enable the timely use of alternative airway strategies and prevent

www.ajmrhs.com
eISSN: 2583-7761

Date of Received: 12-03-2026
Date Acceptance: 11-05-2026
Date of Publication: 16-05-2026

complications such as hypoxemia or airway trauma. Anaesthesiologists can assess the risk of difficult airway management through a combination of clinical examination and relevant investigations, allowing formulation of an appropriate and safe airway management plan.

Accurate preoperative prediction of difficult intubation remains a cornerstone of safe anaesthesia practice. The Modified Mallampati classification is a widely used bedside airway assessment tool [5]. Traditionally performed in the sitting position, its reliability in different patient positions remains a subject of interest. This study was designed to evaluate whether Mallampati scoring performed in the sitting or supine position better predicts difficult intubation in patients undergoing general anaesthesia. We hypothesised that the predictive ability of the Mallampati test would differ between these two positions, with the alternate hypothesis proposing superior prediction in the supine position. In contrast, the null hypothesis assumes no difference. Accordingly, this study aims to compare the Mallampati assessment in sitting and supine positions for predicting difficult intubation. The primary objective is to assess and compare the diagnostic accuracy of Mallampati grading in both positions and its correlation with Cormack–Lehane grading (classification used to evaluate the view of the larynx during direct laryngoscopy) [6], while the secondary objective is to evaluate the applicability of supine Mallampati scoring in predicting a difficult airway.

METHODS & MATERIALS

This Observational study was conducted at Assam Medical College & Hospital, Dibrugarh, Assam, on adult patients who underwent general anaesthesia and required endotracheal intubation at AMCH. The sample size was calculated considering the sensitivity of Mallampati grading in predicting difficult intubation to be 41.2%, based on published literature, with 95% confidence and an absolute error of 10% [7]. The inclusion criteria comprised adult patients aged between 18 and 70 years, classified as ASA physical status I or II, who underwent surgery under general anaesthesia requiring endotracheal intubation. The exclusion criteria included patients with an ASA physical status greater than II, those requiring rapid sequence induction and those who did not provide informed consent. Additionally, individuals with a previous history of difficult intubation, maxillofacial anomalies, or any pathology involving the upper airway, such as oral cavity masses, gaps in the anterior teeth, edentulous status, restricted neck movement, or inability to sit (e.g., due to cervical spine fracture or prolapsed intervertebral disc) were excluded from the study. The cases were recruited with proper written consent, and data were collected in a structured proforma. The study was approved by the Institutional Ethics Committee, AMCH.

All patients satisfying the inclusion criteria posted for elective surgery were recruited for this study. The study variables included the assessment of the airway using seated and supine positions of the Modified Mallampati test. In both positions, patients were instructed to open their mouths maximally and protrude their tongues without phonation. Based on the visibility of oropharyngeal structures, the airway was graded from Class I to Class IV. The outcome variable was the laryngoscopic view obtained during intubation, assessed using the Cormack-Lehane grading system. All participants underwent a pre-anaesthetic evaluation in the pre-anaesthetic clinic, where the Modified Mallampati classification was assessed in both sitting and supine positions. In the sitting position, patients were instructed to keep the head in a neutral position, open the mouth maximally, and protrude the tongue without phonation, while the examiner maintained eye-level alignment. In the supine position, assessment was performed with the head supported on a 5-6 cm pillow, neck in neutral alignment, and the examiner positioned at the head end, observing the oropharyngeal structures from above. The remaining part of the study was done in different operation theatres of AMCH. Direct laryngoscopy was performed under optimal conditions of patient positioning and muscle relaxation, with up to three attempts allowed; a drop in SpO_2 was considered an endpoint for discontinuation. The best laryngoscopic view obtained was graded using the Modified Cormack-Lehane classification, with Grades 1 and 2 considered easy intubation and Grades 3 and 4 considered difficult intubation. The predictive accuracy of the Modified Mallampati test in both positions was then evaluated. Following successful intubation, surgery proceeded as planned, and at the end of the procedure, neuromuscular blockade was reversed and patients were extubated.

RESULTS

In the present study, 100 cases were enrolled, with the mean age was 43.73 ±13.51 years The maximum number of patients was in the age group 41-50 years (n=30). Among all the patients, 50 were male and 50 were female, whereas 65 patients belong to ASA-I and 35 patients belong to ASA II (Table 1). The mean baseline heart rate, in beats per minute, was 77.25 and the mean systolic and diastolic blood pressure were 124.70 and 79.95, respectively. The Mean baseline heart rate, in beats per minute was 77.25 and the mean systolic and diastolic blood pressure was 124.70 and 79.95, respectively (Table 2).

Particulars	No (n)	Percentage (%)
Age group		
18-30 years	20	20%
31-40 years	18	18%
41-50 years	30	30%
51-60 years	25	25%
61-70 years	7	7%
Gender		
Male	50	50%
Female	50	50%
ASA status		
ASA I	65	65%
ASA II	35	35%

Table 1: Age, Gender and ASA status-wise distribution of patients enrolled in the study

Preoperative Vitals	Mean (±SD)
HR (Beats/min)	77.25 (10.17)
SBP (mmHg)	124.70 (15.33)
DBP (mmHg)	79.95 (10.68)
MAP (mmHg)	92.02 (19.78)
RR/min	14.29 (1.96)
SpO2 (%)	98.86 (1.10)

Table 2: The Table Showing Baseline Haemodynamics Of Cases

For Mallampati grading in the sitting position, among 100 patients, 35, 45, 18 and 2 patients were having grade I, grade II, grade III and grade IV, respectively, whereas for the supine position, 13,47,33 &7 patients were having grade I, grade II, grade III and grade IV, respectively (Table 3). After evaluating Mallampati grading in the sitting and supine position, patients were taken for intubation and Cormack-Lehane gradings were obtained. Among 100 patients, 61 patients got Cormack Lehane grade 1.16 and 8 patients got grade 2a and 2b, respectively. Grade 3 was seen with 15 patients and no patients had Grade 4 (Table 4).

Mallampati (MLPT) Grade		Sitting Position	Supine Position
Position	**Grade**	**Number (%)**	**Number (%)**
Soft palate, faucial pillars and uvula visible	Grade I	33 (33%)	13 (13%)
Soft palate and faucial pillars visible, but uvula obscured by base of tongue	Grade II	45 (45%)	47 (47%)
Only the soft palate is visible	Grade III	18 (18%)	33 (33%)
Only the hard palate is visible	Grade IV	2 (2%)	7 (7%)

Table 3: Observation of Mallampati (MLPT) Grade in Sitting position and Supine position

Cormack-Lehane (CL) Grade		Number (%)
Full view glottis	Grade 1	61(61%)
Partial view of glottis	Grade 2a	16 (16%)
Only posterior extremity of the glottis is seen or only the arytenoid cartilages	Grade 2b	8(8%)
Only epiglottis is seen, none of the glottis seen	Grade 3	15 (15%)
Neither the glottis nor the epiglottis is seen	Grade 4	0

Table 4: Number of observations with Cormack-Lehane (CL) Grade

The observed data demonstrate a strong and statistically significant correlation between Mallampati grades assessed in sitting and supine positions (p=<0.001). A consistent trend was noted wherein patients with lower Mallampati grades in the sitting position largely remained within lower grades in the supine position. Specifically, among those classified as Mallampati Grade 1 in the sitting position, the majority were graded as 2 (60%) and 1 (34.29%) in the supine position, with only a small proportion shifting to higher grades. Similarly, patients with Mallampati Grade 2 in the sitting position were predominantly distributed between Grades 2 (51.11%) and 3 (46.67%) in the supine

position, indicating a tendency toward higher grading when supine. This upward shift was more evident in higher Mallampati grades, where 55.56% of sitting Grade 3 patients remained Grade 3 and 27.78% progressed to Grade 4 in the supine position. Notably, all patients with Mallampati Grade 4 in the sitting position were consistently classified as Grade 4 in the supine position (Table 5).

	Supine Position										
	1		2		3		4		TOTAL		
Sitting Position	n	%	n	%	n	%	n	%	N	%	p value
1	12	34.29	21	60.00	2	5.71	0	0.00	35	100.00	<0.001
2	1	2.22	23	51.11	21	46.67	0	0.00	45	100.00	
3	0	0.00	3	16.67	10	55.56	5	27.78	18	100.00	
4	0	0.00	0	0.00	0	0.00	2	100.00	2	100.00	
Total	13	13.00	47	47.00	33	33.00	7	7.00	100	100.00	
"*Fisher Exact Test; The p-value is significant at 5% level of significance".											

Table 5: Correlation between Mallampati grade in sitting and supine positions

The observed data demonstrate a statistically significant correlation between Mallampati grades assessed in both sitting and supine positions with the Cormack-Lehane (CL) grading. In the sitting position, a clear trend was observed wherein lower Mallampati grades were predominantly associated with easier laryngoscopic views (CL Grade 1), with 80% of Mallampati Grade 1 patients falling into CL Grade 1, while higher Mallampati grades showed a progressive shift toward more difficult CL grades. Notably, Mallampati Grade 4 in the sitting position was entirely associated with CL Grade 3, indicating difficult laryngoscopy. Similarly, in the supine position, the correlation appeared stronger, with 100% of Mallampati Grade 1 patients corresponding to CL Grade 1, and higher grades demonstrating an increasing proportion of CL Grade 2 and 3 views. Mallampati Grade 4 in the supine position showed a high association with difficult laryngoscopy, with 85.7% in CL Grade 3. The association was statistically significant in both positions (p=<0.001 for sitting and p=0.001 for supine), suggesting that Mallampati grading, particularly in the supine position, is a reliable predictor of laryngoscopic difficulty as assessed by CL grading (Table 6).

	Cormack-Lehane (CL) Grades					
	1	2	3	4	TOTAL	p value
	n(%)	n(%)	n(%)	n(%)	N(%)	
Sitting Position						
1	28 (80.00)	7 (20.00)	0	0	35 (100.00)	<0.001
2	27 (60.00)	10 (22.22)	8 (17.88)	0	45 (100.00)	
3	6 (33.33)	7 (38.88)	5 (27.78)	0	18 (100.00)	
4	0	0	2 (100.00)	0	2 (100.00)	
Total	61 (61.00)	24 (24.00)	15 (15.00)	0	100 (100.00)	
Supine Position						
1	13 (100.00)	0	0	0	13 (100.00)	0.001
2	38 (80.90)	9 (19.10)	0	0	47 (100.00)	
3	10 (30.30)	14 (42.40)	9 (27.30)	0	33 (100.00)	
4	0	1 (14.30)	6 (85.7)	0	7 (100.00)	
Total	61 (61.00)	24 (24.00)	15 (15.00)	0	100 (100.00)	

Table 6: Correlation between Mallampati grade sitting, supine position and Cormack-Lehane (CL) Grade

The receiver operating characteristic (ROC) curve analysis demonstrated a moderate diagnostic performance of the modified Mallampati test (MLPT) grade assessed in the sitting position for predicting difficult laryngoscopy as defined by the Cormack-Lehane grading. The area under the curve (AUC) was 0.713, indicating acceptable discriminative ability. This finding was statistically significant (asymptotic sig= 0.003), suggesting that the MLPT grade is a reliable predictor beyond chance. Whereas, for the ROC for the supine position, a good diagnostic performance was observed with an AUC of 0.828. This association was highly statistically significant (asymptotic significance = 0.00), confirming that the predictive capability of MLPT in the supine position is unlikely to be due to chance (Figure 1)

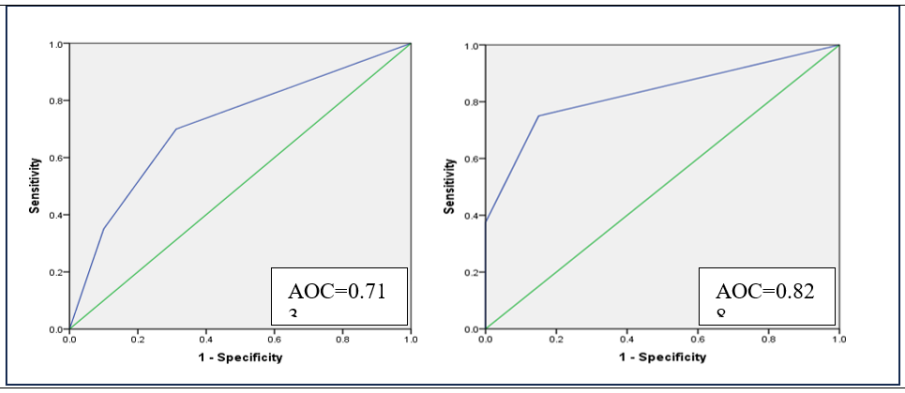

Figure 1: Receiver Operating Curve predicting the diagnostic accuracy of Mallampati Grading in sitting position (left) and Supine position (right), correlating with difficult Cormack-Lehane Grading

DISCUSSION

Anaesthesiologists need to recognize the possibility of an unanticipated difficult intubation to lower morbidity. This study aimed to assess the effectiveness of the Mallampati grading system in predicting difficult intubation in sitting and supine positions, and to identify which position offers greater predictive accuracy. All participants were assessed by a trained anaesthesiologist for Mallampati grading (MPG) in both sitting and supine positions.

The distribution of Mallampati grading differed notably between the sitting and supine positions. In the sitting position, the majority of patients were classified as Grade II (45%), followed by Grade I (33%), while fewer patients were categorised as Grade III (18%) and Grade IV (2%). The result suggests potential challenges due to reduced visibility of the oropharyngeal structures. In contrast, in the supine position, Grade II remained the most common (47%), however, there was a marked increase in higher grades, with Grade III rising to 33% and Grade IV to 7%, while Grade I decreased substantially to 13%. This shift indicates that the change in position affected the visibility and assessment of the oropharyngeal structures, potentially altering the predicted difficulty of intubation. This shift toward higher Mallampati grades in the supine position suggests that airway visualization becomes more restricted when patients are lying down, likely due to posterior displacement of the tongue and soft tissues. Consequently, the supine position appears to identify a greater number of potentially difficult airways compared to the sitting position. From a clinical perspective, this indicates that Mallampati assessment in the supine position may provide a more sensitive prediction of difficult intubation, although it may also overestimate difficulty in some cases. A past study by E. J. Tham (1992) demonstrated that both posture and phonation significantly influence Mallampati grading [8]. The study reported that phonation during assessment improved visualization of the pharyngeal structures, whereas the supine position led to poorer airway views. Another study by Ashish Bindra et al. (2010), in a study of 123 patients, reported that Mallampati assessment in the supine position was a better predictor of difficult intubation, with a higher positive predictive value compared to the sitting position, suggesting improved identification of true difficult airways [9]. In contrast, F. E. Amadasun et al. (2010), in a larger cohort of 390 patients, found that phonation consistently improved Mallampati grading across positions, and identified the sitting position with maximal head extension and without phonation as the most reliable, correlating best with laryngoscopic view [10].

The correlation between Mallampati grades assessed in sitting and supine positions demonstrates a statistically significant association (Fisher Exact test, $p < 0.001$), indicating that patient positioning has a meaningful impact on airway assessment. Although a general trend of agreement between the two positions is observed, notable shifts toward higher Mallampati grades in the supine position are evident. For instance, a considerable proportion of patients classified as Grade 1 in the sitting position were reclassified as Grade 2 or even Grade 3 when assessed supine. Similarly, patients with Grade 2 in the sitting position showed redistribution into higher grades in the supine posture. This upward shift suggests that the supine position may unmask a relatively poorer oropharyngeal view, possibly due to posterior displacement of the tongue and soft tissues under gravity. Higher grades (Grade 3 and 4) also show reasonable consistency but still demonstrate some positional variation. Overall, these findings highlight that Mallampati grading in the supine position may provide a more conservative and clinically relevant prediction of difficult airway, emphasizing the importance of considering patient positioning during preoperative airway evaluation.

The correlation between the Cormack-Lehane grade and the Mallampati test in both sitting and supine positions showed statistically significant results.

This suggests that Mallampati grading, irrespective of patient position, is strongly associated with laryngoscopic view during intubation. These findings are consistent with several previous studies [11-13]. The area under the curve of the Mallampati grade in the sitting position on the receiver operating curve was found to be 0.713 (95% CI 0.581-0.846), which was less than the 0.828 (95% CI 0.738-0.918) in the supine position, indicating that the supine position is superior to the sitting position in predicting difficult intubation. A study by Hanouz et al (2018) showed similar results, with AUC improving from 0.70 in the sitting position to 0.82 in the supine position ($p < 0.001$), supporting our finding that the supine position offers better predictive accuracy for airway assessment [11]. Consistent with our findings, Singhal et al also reported that when patients were shifted from the sitting to the supine position, there was a statistically significant change ($p < 0.0001$), with Mallampati grades consistently increasing [14]. Waseem Ahmad Khan et al reported similar findings in an observational study of acromegaly patients undergoing pituitary adenoma surgery under general anaesthesia. Their study demonstrated better diagnostic performance of airway assessment in the supine position, with a higher AUC compared to the sitting position. Although they used the Naguib score rather than the Cormack-Lehane grading used in our study, their results align with our observations, indicating superior predictive value in the supine posture [12]. The findings indicate a strong and statistically significant correlation between Mallampati grading and Cormack-Lehane view in both sitting and supine positions, confirming the reliability of the Mallampati test as a predictor of difficult intubation. In conclusion, the supine position provides better predictive accuracy than the sitting position for assessing difficult intubation and may be more reliable for routine preoperative airway evaluation.

CONCLUSION

This study concludes that Mallampati grading in the supine position is more effective than in the sitting position for predicting difficult intubation, although both positions remain useful. It can serve as a simple bedside screening tool; however, combining it with other airway assessment methods improves accuracy. Mallampati grading is a useful predictor of difficult intubation in both positions, but the supine position provides better accuracy. Further research with larger and more diverse populations is needed to validate these findings and assess the feasibility of routine use of the supine position in clinical practice.

REFERENCE

1. Law JA, Broemling N, Cooper RM, et al.. The difficult airway with recommendations for management – Part 1 – Difficult tracheal intubation encountered in an unconscious/induced patient. Can J Anaesth. 2013;60(11):1089–1118. 10.1007/s12630-013-0019-3
2. Freck C, Mitchell VS, McNarry, Medonca C, Bhagrath PA. Difficult Airway Society 2015 Guidelines for management of unanticipated difficult intubation in adults. BJA Br J Anaesth. 2015; 115(6):827–48.
3. Marshall SD P jj. Radical evolution:the 2015 Difficult Airway Society guidelines for managing unanticipated difficult or failed tracheal intubation. Anaesthesia. 2015;71(2):131–7.
4. SM Crawley, AJ Dalton.Predicting the difficult airway.Continuing Education in Anaesthesia, Critical Care & Pain j 2014;253-258
5. Samsoon GL, Young JR. Difficult tracheal intubation: a retrospective study. Anaesthesia. 1987;42(5):487-90. doi:10.1111/j.1365-2044.1987.tb04039.x.
6. Cormack RS, Lehane J. Difficult tracheal intubation in obstetrics. Anaesthesia. 1984;39(11):1105-11. doi:10.1111/j.1365-2044.1984.tb08932.x.
7. Chatterjee A, Maheshwari VS, Mahanty PR, Nag DS, Shukla R. A Prospective, Comparative Study to Evaluate the Diagnostic Accuracy of Mallampati Grading in Supine and Sitting Positions for Prediction of Difficult Airway. Cureus. 2021 Oct 3;13(10):e18465. doi: 10.7759/cureus.18465. PMID: 34754631; PMCID: PMC8569641.
8. Tham EJ, Gildersleve CD, Sanders LD, Mapleson WW, Vaughan RS.Effects of posture, phonation and observer on Mallampati classification. Br J Anaesth. 1992;68:32-38.
9. Bindra A, Prabhakar H, Singh GP, Ali Z, Singhal V. Is the modified Mallampati test performed in supine position a reliable predictor of difficult tracheal intubation? Journal of Anesthesia. 2010;24(3):482–485. doi:10.1007/s00540-010-0923-4.
10. Amadasun FE, Adudu OP, Sadiq A. Effects of position and phonation on oropharyngeal view and correlation with laryngoscopic view. Niger J Clin Pract. 2010;13(4):417–420.
11. Hanouz JL, Bonnet V, Buleon C, et al.: Comparison of the Mallampati classification in sitting and supine position to predict difficult tracheal intubation:a prospective observational cohort study.Anaesth Analg.2018, 126:161-169.
12. Khan WA, Bloria SD, Luthra A, Chauhan R, Meena SC, et al. Comparison of modified Mallampati grading in sitting and supine

position to predict difficult intubation in acromegaly patients. Trends in Anaesthesia and Critical Care. 2020;35:4–10. doi:10.1016/j.tacc.2020.07.012.

13. Awasthi P, Gautam S, Malik A, Singh V, Kohali M, Jafa S, et al. Comparison of Mallampati test in supine and upright positions with and without phonation in predicting difficult laryngoscopy and intubation in age groups 3-10 years. Pediatr Anesth Crit Care J. 2018;6(2):61-67. doi:10.14587/paccj.2018.10

14. Singhal V, Sharma M, Prabhakar H, Ali Z, Singh GP: Effect of posture on mouth opening and modified Mallampati classification for airway assessment. J Anesth. 2009, 23:463-465. 10.1007/s00540-009-0761-4.

How to cite this article: Dr. Deeshna A., Dr. Peter Engti, Dr. Biswajit Talukdar, Dr. Karuna Kumar Das, Dr. Arindom Phukan, A COMPARATIVE ANALYSIS OF MALLAMPATI GRADING IN SITTING AND SUPINE POSITIONS FOR DIFFICULT INTUBATION, Asian J. Med. Res. Health Sci., 2026; 4 (2):-315-321.

Source of Support: Nil, Conflicts of Interest: None declared.