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A Comparison Of The Effectiveness Of The Mallampati Score And Other Methods In Predicting Intubation Difficulty: A Systematic Literature Review

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Abstract

Intubation difficulties are a major challenge in airway management for patients undergoing general anesthesia, as they can lead to hypoxia, aspiration, airway trauma, and even death. The Mallampati Score is the most commonly used predictive method in preoperative assessment; however, its accuracy as a single predictor remains limited. Various other methods, such as thyromental distance, sternomental distance, Cormack-Lehane grading, the upper lip bite test, and multivariate models, are also used to improve predictive accuracy. This study aims to compare the effectiveness of the Mallampati Score and other methods in predicting intubation difficulty. This study employed a Systematic Literature Review (SLR) following the PRISMA guidelines. A literature search was conducted in the PubMed, ScienceDirect, and Google Scholar databases covering the years 2016–2026. Included studies comprised randomized controlled trials, cohort studies, prospective studies, and retrospective comparative studies evaluating the Mallampati Score and other methods in predicting intubation difficulty in patients undergoing general anesthesia. Quality assessment was performed using the Joanna Briggs Institute (JBI) instrument. A total of 1,104 articles were identified in the initial stage. After removing duplicates, 1,061 articles were selected for screening. A total of 24 articles passed the selection based on title, year, method, and abstract. Thirteen articles underwent full-text review, and 8 articles met the inclusion criteria for analysis. The results indicate that the Mallampati Score remains effective as an initial screening tool because it is simple, quick, non-invasive, and has reasonably good sensitivity. However, the Mallampati Score is not sufficiently robust when used as a single predictor. Other methods, such as thyromental distance, have higher specificity, while combinations of multiple parameters or machine learning approaches demonstrate better predictive accuracy. The Mallampati Score remains relevant as an initial screening tool for predicting intubation difficulty, but its effectiveness is optimized when combined with other methods. No single method is the most accurate; therefore, a multimodal approach is the most rational strategy for evaluating difficult airways.

Keywords: Mallampati Score, Difficult Intubation, Airway Assessment, Thyromental Distance, Systematic Literature Review.

INTRODUCTION

Difficult intubation is a significant issue in anesthetic practice, as it may lead to impaired ventilation, hypoxia, aspiration, airway trauma, increased intracranial pressure, and even death. This condition represents a major concern during preoperative evaluation, particularly in patients undergoing general anesthesia who require endotracheal tube placement to ensure airway patency. The incidence of difficult intubation has been reported to vary across studies, and it is more frequently observed in patients with risk factors such as obesity, anatomical abnormalities, limited neck mobility, or a history of previous difficult intubation.

One of the most commonly used methods to assess the potential for difficult intubation is the Mallampati Score. This examination is performed by evaluating the visibility of oropharyngeal structures while the patient opens their mouth widely and protrudes the tongue. The Mallampati Score is widely utilized because it is simple, rapid, inexpensive, and non-invasive. Nevertheless, several studies have demonstrated that its predictive value remains inconsistent when used as a sole predictor of difficult intubation. The results of the assessment may also be influenced by patient positioning, examination technique, and observer subjectivity.

In addition to the Mallampati Score, various other methods are used in airway assessment, including thyromental distance, sternomental distance, upper lip bite test, Cormack–Lehane grading, and machine learning–based prediction models. Some of these methods have been reported to offer

specific advantages, such as higher specificity or improved predictive performance in particular populations, for instance obese patients or obstetric patients. However, to date, no consensus has been reached regarding the most effective method for widespread use in clinical practice.

Based on these considerations, a systematic literature review is needed to comprehensively evaluate research findings related to the effectiveness of the Mallampati Score compared with other methods in predicting difficult intubation. This review is expected to provide a clearer understanding of the role of the Mallampati Score in airway evaluation, as well as the importance of a multimodal approach to improve predictive accuracy and patient safety.

RESEARCH METHODS

Study Design and Search Strategy

This study employed a Systematic Literature Review (SLR) method using the PRISMA approach. The study aimed to identify, evaluate, and synthesize research findings regarding the comparative effectiveness of the Mallampati Score and other methods in predicting difficult intubation. The Population, Intervention, Comparison, Outcome (PICO) framework was utilized to define the focus of the study.

Data Sources and Search Strategy

A comprehensive literature search was conducted across the electronic databases PubMed, ScienceDirect, and Google Scholar. The search covered publications from 2016 to 2026. The keywords used included “Mallampati score,” “difficult intubation,” “airway assessment,” and “intubation prediction.” Additional keywords included “Modified Mallampati,” “Cormack–Lehane,” “thyromental distance,” “upper lip bite test,” and “prediction of difficult airway.” The search strategy was implemented by combining keywords using the Boolean operators AND and OR to enhance the sensitivity and specificity of the search results.

Study Eligibility and Selection Criteria

Studies included in this review comprised randomized controlled trials, cohort studies, prospective studies, and retrospective comparative studies involving patients undergoing intubation under general anesthesia. The intervention of interest was the use of the Mallampati Score as a predictive tool, with or without comparison to other methods such as thyromental distance, sternomental distance, upper lip bite test, Cormack–Lehane grading, or other predictive models. The outcomes evaluated included the degree of intubation difficulty, laryngoscopic difficulty, sensitivity, specificity, and predictive accuracy.

Studies were excluded if they did not involve patients under general anesthesia, did not assess clinically relevant outcomes related to difficult intubation, did not compare the Mallampati Score with other methods, were published outside the 2016–2026 period, were written in languages other than Indonesian or English, or were in the form of literature reviews, meta-analyses, case reports, or qualitative studies. Study selection was conducted through title and abstract screening, followed by full-text review.

Data Extraction and Assessment of Risk of Bias

Data extraction was performed based on the authors’ names, year of publication, country of study, study design, sample size and characteristics, methods compared, and the main findings of the study. The methodological quality and risk of bias were assessed using the Joanna Briggs Institute (JBI) appraisal tools, in accordance with the design of each study. Studies were subsequently categorized as included or excluded based on the results of the quality assessment and their conformity with the study criteria.

Research Outputs

The primary outcome of this study was the effectiveness of the Mallampati Score compared with other methods in predicting difficult intubation. Effectiveness was assessed in terms of

sensitivity, specificity, correlation with laryngoscopic or intubation difficulty, and the predictive values of each method. Secondary outcomes included the influence of examination position, assessment cut-off values, and the performance of each method in specific populations.

Data Analysis

Data analysis was conducted descriptively using a narrative synthesis approach due to heterogeneity in study designs, variation in the methods compared, and differences in the outcomes measured. The data were presented in tables and descriptive narratives to facilitate comparison across studies.

RESULTS AND DISCUSSION

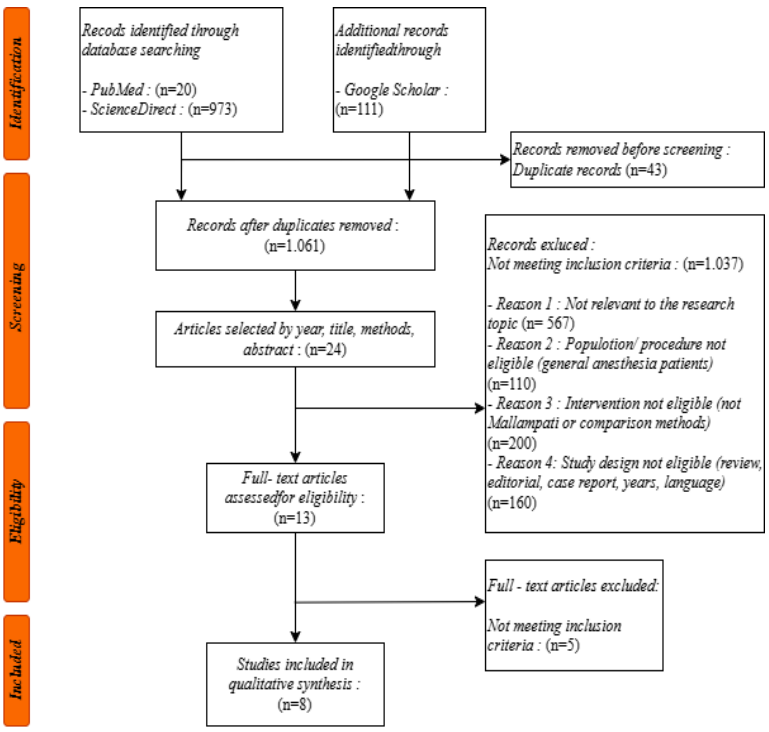

Figure 1. PRISMA Flowchart

A systematic literature search was conducted in PubMed, ScienceDirect, and Google Scholar, yielding a total of 1,104 identified articles. After removing duplicates, 1,061 articles remained and were screened based on title, publication year, methodology, and abstract. A total of 1,037 articles were excluded for not meeting the inclusion criteria, leaving 24 articles for further assessment. Of these, 13 articles underwent full-text review, and 5 were excluded for failing to meet the eligibility criteria, resulting in 8 studies included in the final analysis. The selection process is presented in a PRISMA flowchart.

The selected studies were appraised using the Joanna Briggs Institute (JBI) Critical Appraisal tools and data were extracted based on the PICO framework. The analysis indicated that the Mallampati Score retains clinical value as an initial screening tool; however, certain alternative methods demonstrate specific advantages, particularly in terms of specificity or predictive accuracy in selected populations.

Table 1. Study Characteristics Table

Title	Author's name & Year of publication	Research Methodology	Sample Quantity & Characteristics	Interventions Used	Key Results
Correlation of Modified Mallampati Classification with Cormack–Lehane Grading in Predicting Difficult Airway: A Prospective Observational Study	Priya D et al., 2026	Prospective observational study	n = 216	Modified Mallampati Classification vs Cormack–Lehane grading	There is a significant relationship between Mallampati and Cormack–Lehane, but the accuracy of the predictions is inconsistent so Mallampati cannot be used as a single predictor
Predictive model for difficult laryngoscopy using machine learning: retrospective cohort study	Kim et al., 2022	Retrospective cohort study	n = 616	Combination of Mallampati, age, sternomental distance, BMI, neck circumference	The best model uses a combination of Mallampati, age, and sternomental distance with an AUROC of 0.71 and a sensitivity of 0.85
Comparison of the modified Mallampati classification score versus the best visible Mallampati score in the prediction of difficult tracheal intubation	Hanouz et al., 2024	Prospective observational study	n = 3.243	Modified Mallampati vs best visible Mallampati	Best visible Mallampati decreased sensitivity and misclassified about 53% of patients with difficult intubation
Comparison of Airway Assessment with Modified Mallampati Classification in Supine and Upright Positions in Predicting Difficult Laryngoscopy and Intubation	Nadkarni et al., 2022	Prospective observational study	n = 350	Mallampati sitting vs supine position	There is no significant difference between the sitting and supine positions, so the supine position can be used with relative accuracy
Is Mallampati classification a good screening test? A prospective cohort evaluating the predictive values of Mallampati test at different thresholds	Carvalho et al., 2022	Prospective cohort	n = 570	Mallampati with some cut-offs	The class II cut-off provides the highest sensitivity of 94.44% for difficult airway screening
Prediction of difficult intubation in apparently normal patients by combining modified mallampati test and thyromental distance	Pathak & Sah, 2020	Prospective observational study	n = 80	Mallampati, thyromental distance, and a combination of the two	Mallampati has a sensitivity of 72.7%, while thyromental distance has a specificity of 100%

A Comparison of the Mallampati evaluation in neutral or extended cervical spine positions	Healy et al., 2016	Retrospective observational study	n = 80.801	Neutral position vs cervical extension	Cervical extensions increase specificity but decrease sensitivity, so a neutral position is more recommended
Airway events in pregnant patients with morbid obesity undergoing caesarean delivery under general anaesthesia	Saracoglu et al., 2026	Retrospective cohort study	n = 315	Mallampati, thyromental distance, BMI, komorbid	Thyromental distance is the strongest predictor of ventilation and intubation difficulties in morbid obese patients

Characteristics of the Study

A total of eight studies published between 2016 and 2026 were included in this review, involving patients undergoing general anesthesia and intubation. The study designs included prospective observational studies, retrospective cohort studies, and prospective cohort studies. The methods compared encompassed the Mallampati Score in relation to Cormack–Lehane grading, thyromental distance, Mallampati examination position, best visible Mallampati, and multivariate machine learning–based approaches. The outcomes assessed primarily focused on sensitivity, specificity, correlation with difficult laryngoscopy, and predictive accuracy.

Risk Of Bias Assesment

Bias risk assessments were conducted using the Joanna Briggs Institute (JBI) tool, tailored to the design of each study. Most studies demonstrated fairly good methodological quality. However, some studies had limitations, including retrospective designs, small sample sizes, lack of randomization, and potential selection bias. Overall, the quality of evidence in this review was deemed sufficient to support conclusions regarding the effectiveness of the Mallampati Score and other methods in predicting intubation difficulty.

Discussion

The results of this systematic literature review indicate that the Mallampati Score remains effective as an initial screening tool in airway assessment. This examination offers advantages in terms of simplicity, speed, low cost, and non-invasive nature. In several studies, the Mallampati Score demonstrated relatively high sensitivity, particularly when specific cut-off values were applied, making it useful for identifying a broad range of patients at risk of difficult intubation. These findings reinforce the role of the Mallampati Score as an initial tool in preoperative evaluation.

Nevertheless, the Mallampati Score is not sufficiently robust when used as a standalone predictor. The study by Priya D et al. (2026) demonstrated a significant association between the Mallampati Score and Cormack–Lehane grading; however, the correlation was only moderate. Similarly, the study by Hanouz et al. (2024) showed that variations in assessment techniques, such as the best visible Mallampati, may improve specificity but at the expense of reduced sensitivity. This underscores that while the Mallampati Score is useful, its accuracy is influenced by multiple factors.

In direct comparisons with other methods, thyromental distance demonstrated higher specificity than the Mallampati Score. The study by Pathak and Sah (2020) showed that the Mallampati Score was more sensitive, whereas thyromental distance was more specific in predicting difficult intubation. These findings suggest that each method has distinct advantages. In specific populations, such as pregnant patients with morbid obesity, thyromental distance has even been shown to be a more consistent predictor than the Mallampati Score. Therefore, the use of a single method alone is insufficient to fully capture the risk of difficult airway.

Machine learning–based studies have demonstrated that combining multiple variables, such as the Mallampati Score, age, and sternomental distance, yields higher predictive accuracy compared with the Mallampati Score alone. This supports the concept that airway assessment should be

performed using a multimodal approach. In clinical practice, this approach is safer as it integrates multiple anatomical and clinical factors to improve predictive accuracy and reduce the risk of overlooking high-risk patients.

Overall, the findings of this review confirm that the Mallampati Score remains relevant in airway evaluation; however, its interpretation should be performed cautiously and in combination with other methods. A multimodal approach is more aligned with modern anesthetic practice, as no single method provides optimal predictive accuracy for difficult intubation across all patient populations.

CONCLUSION

Based on the results of the systematic literature review, it can be concluded that the Mallampati Score remains an effective airway assessment method as an initial screening tool for predicting intubation difficulty. The Mallampati Score is easy to perform, non-invasive, and has fairly good sensitivity, particularly at certain cutoff points. However, the Mallampati Score is not sufficiently accurate when used as a single predictor because its results are influenced by examination technique, patient position, and population characteristics.

Other methods, such as thyromental distance, sternomental distance, and multivariate combination models, demonstrate significant contributions to improving predictive accuracy. Therefore, there is no single optimal method for predicting intubation difficulty. The most effective approach is multimodal airway assessment, using the Mallampati Score as an initial screening tool combined with other clinical parameters to enhance patient safety and prediction accuracy in anesthetic practice.

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