high-activity group, but the highest was in the moderately active and inactive groups. This aligns with the hypothesis that a complete lack of activity is as harmful as insufficient, irregular activity ("weekend warriors"), which can create peak loads on an unprepared musculoskeletal system [3].

The fact that pain intensity was higher among the most active participants deserves special attention. It is possible these individuals experience pain related to acute or chronic overuse (tendinopathies, stress fractures) but continue to train. This underscores the need to educate amateur athletes on proper technique, rest, and the importance of timely diagnosis.

The high proportion of recently emerged pain among inactive participants suggests that in some cases, pain is the cause, rather than the consequence, of inactivity.

Limitations. The cross-sectional design does not allow for the establishment of cause-and-effect relationships. The data are based on self-report, which may lead to recall bias.

Conclusions

Joint pain is a common problem, affecting more than a quarter of physically active and inactive individuals. Our results show that maintaining *regular* (3-4 days per week) activity may be associated with a lower likelihood of developing pain compared to irregular activity or complete inactivity. However, the higher pain intensity in the active group requires further investigation to develop safe and effective exercise programs focused on long-term joint health. These findings highlight the need for personalized activity recommendations. Clinicians should assess both activity patterns and joint health to identify at-risk individuals and guide appropriate modifications, ultimately helping to prevent pain progression and improve long-term outcomes.

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A CROSS-SECTIONAL STUDY ON THE PREDICTIVE ACCURACY OF TRADITIONAL BEDSIDE MALLAMPATI TEST VS AI MODELS ANALYSING FACIAL PHOTOGRAPHS

Introduction

The Mallampati test has long been a cornerstone of preoperative airway assessment, offering clinicians a quick, bedside method for predicting difficult intubation. However, its reliance on

subjective visual grading and patient cooperation during examination introduces inherent variability and limits its duplicability. In recent years, the integration of artificial intelligence into medical imaging has opened new avenues for objective anatomical analysis. By evaluating whether machine learning algorithms can identify external anatomical correlates of a difficult airway, this research seeks to determine if non-invasive photographic analysis could serve as a reliable, consistent, and scalable adjunct, or even alternative, to conventional screening methods.

Goal

The primary goal of this study is to compare the predictive accuracy of the traditional bedside Mallampati test against AI-based analysis of facial photographs in assessing difficult airways. Specific objectives also include: Accuracy Assessment, Correlation Analysis between Mallampati classifications and AI-generated predictions and Feature Identification based on facial anatomical features.

Material and methods of research

This prospective cross-sectional study was conducted in the Department of Anesthesiology and Surgery at the Indhira Gandhi District Hospital Mandsaur -Madhya Pradesh-India, from January 2026 to March 2026. A total of 31 patients between ages 20 to 60 scheduled for elective surgical procedures were enrolled in the study. Each patient underwent the standard bedside Mallampati assessment. Simultaneously, standardized facial photographs (anterior views) were captured under consistent lighting conditions. These images were subsequently uploaded to ChatGPT 4.5 with the prompt "Generate the Mallampati Classification for the following Photographs- Check for the anatomical features and Mention the Class-1,2,3 or 4". The data was then statistically assessed in Microsoft Excel.

The results of the research and their discussion

The Mallampati test has been reported to have a sensitivity of 32% and a specificity of 85% [1]. These limitations have led clinicians and researchers to explore advanced technological solutions, specifically artificial intelligence (AI) and machine learning (ML), to improve the accuracy of airway assessments and reduce subjectivity. AI methods, particularly deep learning (DL) and computer vision, can process large datasets, identify intricate patterns, and predict clinical outcomes with high precision [1].

To illustrate the structure of the dataset used in this cross-sectional study, Table 1 presents a representative sample of five patient entries. For each subject, the table shows the traditional Bedside Mallampati Score as assessed by a clinician, alongside the classification generated by the AI model upon analysis of a standardized facial photograph. This side-by-side comparison provides a preliminary, qualitative glimpse into the agreement and discrepancies between the conventional clinical method and the automated AI-driven approach, which will be quantitatively evaluated using the metrics described in the methodology.

Based on the results in Table 2, we can conclude the following statistical agreements; Diagonal cell agreement: The number of cases where human and AI assigned the same category is the sum of the diagonal entries: 6+5+6+1=18. Percentage agreement: 18/31=58.07%. Cohen's Kappa measuring an agreement beyond chance was 0.427 indicating moderate agreement between Human and AI ratings (according to Landis & Koch, 1977).

As for the Chi-square (χ^2) test of independence, χ^2=21.33; Degrees of freedom: (4−1) × (4−1) = 9; p-value: 0.011 (using the chi-square distribution); (χ^2 = 21.33, df = 9, p = 0.011) Since the p-value is less than 0.05, we reject the null hypothesis of independence. There is a statistically significant association between the ratings of Human Observations and AI.

Table 1 – Illustrative Sample of the Dataset Showing Human and AI Classifications

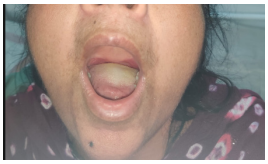
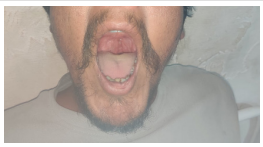
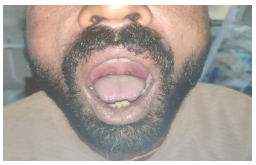
No	Photograph	AI Observation	Doctor's Observation
1		Class 3 Soft palate and the base of the uvula are visible; the rest is obscured by the tongue	Class 3 Only soft palate visible, base of the uvula, and tonsillar pillars are not visible
2		Class 4 Only the hard palate is visible. The soft palate is not seen	Class 3 The base of the uvula and soft palate is visible
3		Class 3 The soft palate is visible, but the uvula is mostly obscured	Class 1 Uvula is small but clearly visible along with a tonsillar pillar and soft palate
4		Class 2 Soft palate and uvula are visible; the pillars are not clearly seen	Class 2 Soft palate and uvula are visible; the pillars are not clearly seen
5		Class 4 Only the hard palate is visible. The soft palate is completely obscured by the tongue	Class 3 Soft palate and base of uvula are seen, and tonsillar pillars are obscured by tongue

Table 2 – Descriptive statistical results of the comparison between AI vs Human interpretations

Human/AI	I	II	III	IV	Total
I	6	0	2	0	8
II	2	5	0	0	7
III	1	2	6	2	11
IV	2	1	1	1	5
Total	11	8	9	3	31

Difficult airway management is a scenario in which the clinician encounters challenges with oxygenation, ventilation, laryngoscopy, and/or tracheal intubation. Several algorithms for difficult airway management and prediction exist, although current protocols demonstrate low sensibility and specificity [2]. Deep-learning (DL) models aim to represent complex data using more superficial hierarchized structures defined from specific features. AI has been developed and implemented in health care with the potential to reduce health inequities and improve global health and anesthesiology outcome [3].

Conclusions

These findings imply that while the AI captures some of the variance in human assessments, its predictive accuracy is only moderate. These findings align with the broader emerging literature on AI applications in airway assessment. Studies examining deep learning approaches to Mallampati classification have reported variable agreement levels, typically ranging from moderate to substantial (kappa values between 0.4 and 0.7). The present study's kappa of 0.427 sits at the lower end of this spectrum. The relatively modest agreement highlights the need for further refinement of AI algorithms and larger validation studies before such models can reliably replace or augment

bedside clinical evaluation. Nonetheless, the significant association supports the potential of AI as a supplementary tool, warranting continued investigation in diverse populations.

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