

Frequency Of Difficult Airway Among Patients Presenting To The Emergency Department Of Hayatabad Medical Complex, Peshawar: A Cross-Sectional Study

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Keywords:
Received on 15 Feb 2025
Accepted on 20 Mar 2025
Published on 31 Mar 2025
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Abstract
Background: The management of the difficult airway is one of the most critical and challenging aspects of emergency department work. A difficult airway refers to a clinical situation where a healthcare provider encounters significant difficulty with face mask ventilation, tracheal intubation, or both. Aim: To determine the frequency of difficult airway in patients presenting to the emergency department. Material and Methods: Ethical approval for the study was obtained from the institutional ethics review board. A total of 196 patients from the emergency department were assessed for airway evaluation and management. Informed consent was obtained from participants. Data were

collected through a structured questionnaire, including demographic details, airway assessment scores (Mallampati Score, Thyromental Distance, Mouth Opening Score), and classification of airway difficulty (moderate, difficult, or very difficult).

Result: Among 196 patients, the majority were male (73%). Most patients were classified as Mallampati Class III (57.5%) and had a Thyromental Distance of less than 6 cm (58%), both indicating a high likelihood of difficult intubation. Additionally, 57% of patients had a mouth opening of 4 cm, and 44.5% were categorized as having a difficult airway, with 29% classified as very difficult. These findings highlight the prevalence of airway management challenges in emergency settings.

Conclusion: The high prevalence of difficult airways in emergency surgery patients underscores the critical need for thorough preoperative airway assessment and preparation. In this study, a significant proportion of patients were classified as Mallampati Class III, had a Thyromental Distance of less than 6 cm, and displayed limited mouth opening, all of which indicate a higher likelihood of airway management complications.

Introduction

The management of the difficult airway is one of the most critical and challenging aspects of emergency department work (1). A difficult airway refers to a clinical situation where a healthcare provider encounters significant difficulty with face mask ventilation, tracheal intubation, or both. This condition is of paramount concern in the emergency department (ED), where rapid and effective airway management can mean the difference between life and death. Airway complications are among the leading causes of morbidity and mortality in critically ill patients, making the evaluation, prediction, and management of difficult airways a cornerstone of emergency care (2). Airway management in the ED is further complicated by the diversity of patient presentations and the urgency of clinical situations (3). Unlike controlled settings such as operating rooms, the ED often deals with unanticipated and time-sensitive cases, which can make the identification and preparation for a difficult airway more challenging. Patients presenting to the ED may have a wide range of underlying conditions, including trauma, sepsis, respiratory failure, or altered mental status, all of which can increase the likelihood of airway difficulties. Additionally, factors such as limited patient history, suboptimal positioning, and environmental constraints further heighten the complexity of managing a difficult airway in this setting (4). Epidemiological data suggest that the incidence of difficult airway situations in the ED is significantly higher compared to other healthcare settings. Studies have reported a wide variation in the frequency of difficult intubation, ranging from 1.5% to over 8% in emergency scenarios, depending on the population studied and the criteria used for

defining a difficult airway. These variations underscore the importance of context-specific research to better understand the prevalence and predictors of difficult airway in emergency settings (5).

Several patient-related, operator-related, and situational factors contribute to the occurrence of a difficult airway. Patient-related factors include anatomical abnormalities, obesity, limited neck mobility, and conditions like obstructive sleep apnea or upper airway trauma. Operator-related factors pertain to the skill level and experience of the clinician performing the airway intervention. Situational factors include the urgency of the procedure, availability of equipment, and environmental conditions such as inadequate lighting or space (3), (6).

Predicting a difficult airway remains a significant challenge, particularly in emergency settings where time and resources are limited. Various tools and scoring systems have been developed to aid in the assessment of airway difficulty, including the Modified Mallampati Test, Thyromental Distance Test, and Cormack-Lehane grading. However, these tools have been predominantly validated in elective surgical populations and may have limited applicability in the ED. Consequently, there is a growing need for research focusing on the development and validation of airway assessment tools tailored to the emergency setting (7).

The assessment of airway difficulty is a critical component of preoperative and emergency airway management, as failed intubation can lead to severe complications, including hypoxia, brain injury, or death. The Modified Mallampati Classification (MMC) and Thyromental Distance (TMD) test are widely utilized clinical tools for predicting difficult airways. The MMC categorizes the airway into four classes based on the visibility of oropharyngeal structures, with higher classes (III and IV) indicating a greater likelihood of intubation challenges. Similarly, the TMD test measures the distance between the thyroid notch and the mentum, with a shorter distance (less than 6.5 cm) suggesting limited mandibular space and an increased risk of difficult laryngoscopy. These tools, when used in combination, enhance predictive accuracy and provide clinicians with a reliable framework for anticipating and managing difficult airway scenarios. The integration of these assessments into routine practice is essential for improving patient safety, especially in high-risk settings such as emergency departments and intensive care units (8), (9).

The implications of failing to manage a difficult airway effectively are profound. Inadequate oxygenation and ventilation can lead to severe complications, including hypoxemia, aspiration, cardiac arrest, and death. Furthermore, repeated attempts at intubation increase the risk of airway trauma, swelling, and further compromise, creating a vicious cycle that can be challenging to break. Therefore, the early identification and prompt management of a difficult airway are essential to improving patient outcomes in the ED (10).

In addition to clinical consequences, difficult airway situations in the ED also have significant implications for healthcare systems. Prolonged airway interventions can lead to delays in care for other critically ill patients, increased utilization of resources, and higher healthcare costs. Moreover, the psychological impact on healthcare providers, including stress and potential litigation, highlights the need for robust training and preparedness in managing difficult airways (11).

Recognizing the frequency and predictors of difficult airway scenarios in the ED is the first step toward improving patient safety and outcomes. Research in this area is crucial for guiding clinical practice, developing protocols, and informing training programs for emergency medicine providers (12), (13). By understanding the prevalence and factors associated with difficult airway, healthcare providers can adopt a more proactive approach, ensuring that the necessary expertise, equipment, and strategies are readily available to manage these high-risk situations effectively (14).

The Difficult Airway Society (DAS) has developed guidelines for the management of unanticipated difficult tracheal intubation in adult patients without upper airway

obstruction. The need for such guidelines was first discussed at the Annual Scientific Meeting of DAS in 1999, and their development began the following year. The aim was to produce simple, clear, and definitive guidelines, similar in structure to those of the Advanced Life Support groups. These guidelines could be used in training drills and followed easily in emergency situations. Definitive guidelines imply the use of recommended techniques at every stage, with these techniques being of proven value and relatively easy to learn. The DAS flowcharts are structured into a series of plans, as no single technique is always effective in airway management. These plans include: Plan A: Initial tracheal intubation plan.

Plan B: Secondary tracheal intubation plan if Plan A fails.

Plan C: Maintenance of oxygenation and ventilation, postponement of surgery, and awakening the patient if earlier plans fail.

Plan D: Rescue techniques for the "can't intubate, can't ventilate" scenario.

The American Society of Anesthesiologists (ASA) defines a difficult airway as a clinical situation in which a conventionally trained anesthesiologist has trouble with mask ventilation, tracheal intubation, or both. Securing the patient's airway is crucial during anesthesia, which involves the reversible loss of consciousness, pain relief, and muscle relaxation. The airway is divided into upper and lower tracts, with the upper airway including structures such as the nose, mouth, pharynx, and larynx. Maintaining a patent airway is essential for adequate oxygenation and ventilation, as failure to do so, even briefly, can be life-threatening (15), (16).

Hypoxia can lead to severe consequences, including irreversible brain injury. Oxygen delivery requires well-perfused alveoli and good ventilation to minimize ventilation/perfusion mismatch. Anesthesiologists must therefore be well-trained to address ventilation and airway problems effectively (17).

Difficult airway management demands a rapid and coordinated team response to prevent patient harm. This response can be challenging due to cognitive overload in highly stressful environments. Guidelines and structured protocols, such as those developed by the ASA and DAS, provide frameworks for decision-making and reduce cognitive load during emergencies. These guidelines often recommend a series of backup plans, including the use of supraglottic airway devices and, if necessary, surgical airways (18).

New technologies and techniques have improved airway management outcomes. For example, video laryngoscopy has gained popularity as a first-line technique in airway management, offering improved glottis exposure and higher success rates in difficult intubations. Laryngeal mask airways (LMA) serve as effective alternatives in cases of failed intubation. Their simple insertion technique and minimal joint movement make them particularly useful in emergency and day-case surgeries (18), (19).

Despite advancements, challenges remain. Repeated intubation attempts increase the risk of airway trauma and worsen subsequent views, leading to a cycle of difficulty. Alternative methods, such as fiber optic intubation and retrograde intubation, may be required in extreme cases. Cricothyroidotomy, performed by creating an airway through the cricothyroid membrane, serves as a last-resort procedure in emergency scenarios (20). Difficult airway management is a key element of emergency treatment, since failure to secure the airway can lead to serious effects such as hypoxia, brain injury, and death. The prevalence of difficult airways in patients coming to the emergency department is a major issue for emergency doctors, since early detection and care are critical for improving patient outcomes. Several studies have looked at the prevalence of difficult airways in the emergency department, with estimates varied depending on patient demographics, clinical context, and accessible resources.

Williams et al. (2018) observed that around 3.5% of all intubation attempts were classed as difficult in a major urban hospital research, indicating that difficult airways occur relatively infrequently but nonetheless pose a considerable problem (21). Robinson et al. (2019) conducted a multi-center research and discovered an incidence of difficult

airways of 4.2%, with the frequency varied among hospitals due to factors such as patient demography and staff skill (22). Patel et al. (2020) discovered a 2.1% reduced incidence in a community hospital emergency department, which they ascribed to advances in airway care and algorithms. These disparities demonstrate how clinical settings, and institutional procedures impact the occurrence of difficult airways in the ED, emphasizing the necessity for continued attention to this issue despite its relative rarity (23). Miller et al. (2017) found that specific medical factors, such as obesity, past airway operations, and craniofacial anomalies, increase the probability of challenging airway management in emergency department patients. Obesity, particularly when paired with a BMI above 30, causes anatomical abnormalities such as reduced neck mobility and airway blockage, complicating intubation. Patients with previous airway operations or injuries may offer extra complications owing to scar tissue or changed airway architecture (24).

In conclusion, managing a difficult airway in the ED is a complex, high-stakes endeavor requiring a combination of clinical skill, adherence to guidelines, and the availability of advanced equipment. Continued research, training, and protocol development are essential to improving patient outcomes and ensuring readiness to address this critical challenge in emergency medicine.

Methods: STUDY DESIGN: This study employed a descriptive cross-sectional design to determine the frequency of difficult airway in patients presenting to emergency departments.

STUDY SETTING:

This study was conducted at Hayatabad Medical Complex Peshawar. Hayatabad Medical Complex Peshawar is one of the largest and most prominent healthcare institutions in Khyber Pakhtunkhwa, Pakistan. With 33 specialized medical and surgical departments, it provides comprehensive healthcare services to a diverse patient population. The hospital employs approximately 1,350 doctors, supported by a total staff of 4,500, including nurses, paramedics, and administrative personnel. This research was conducted from August to December 2024.

SAMPLE SIZE:

A total of 196 emergency patients were enlisted in the study coming to ER at tertiary care hospital Peshawar. Sample size was determined using the finite population correction formula by assuming the prevalence as 0.15 and 5% margin of error at the 95% confidence interval using the following formula

$n = z^2 p (1-p) / E^2$ n=Sample size.

Z=1.96 (95%).

Prevalence (P) =0.15.

Margin of error (E) =0.05 (5%).

Confidence Interval (CI) =95%.

$n = (1.96)^2 \times 0.15(1 - 0.15) / 0.0025 = (196)$

INCLUSION CRITERIA:

All the patients come to ER Departments with compromised airway.

Patients aged are between 18-50years.

Patients belonging to ASA Grade III, IV, V and E (Emergency).

EXCLUSION CRITERIA:

Patients unable to participate in airway assessments, such as Mallampati, Thyromental distance and mouth opening score.

Known airway deformities or tumor in oral cavity.

DATA COLLECTION METHODS

Ethical Considerations: Ethical approval was obtained from the Institutional Ethics Review Board prior to study initiation. Written informed consent was obtained from all participants prior to enrollment. Participant confidentiality was maintained throughout the study by anonymizing all collected data.

Study Population: A total of 196 patients presenting to the Emergency Department were enrolled based on predefined inclusion and exclusion criteria. Patients were assessed to determine the need for airway evaluation or airway management as part of their emergency care.

Data Collection: Data were collected using a structured questionnaire comprising three domains: (1) demographic and clinical information, including age, gender, chief complaint, and type of surgery; (2) airway assessment parameters, including the Mallampati Score, Thyromental Distance, Mouth Opening Score, and classification of airway difficulty (moderate, difficult, or very difficult); and (3) additional clinical observations or remarks.

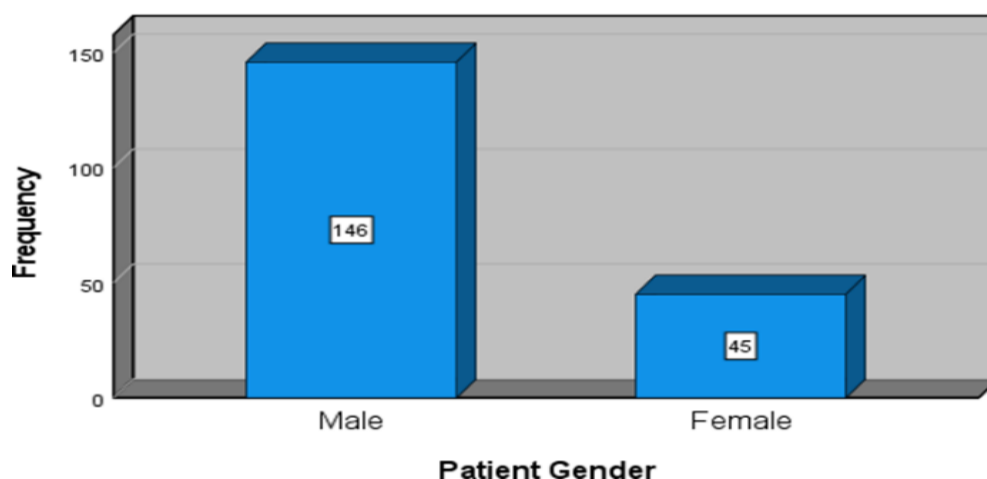
Prior to data collection, the study team was trained on the study objectives, inclusion/exclusion criteria, and standardized administration of the questionnaire. Data were obtained through a combination of patient record review and direct clinical assessment, with all airway assessment scores documented by a trained practitioner to ensure measurement accuracy and consistency.

Data Quality Assurance: The principal investigator conducted regular reviews of the collected data to verify completeness and accuracy, with any discrepancies resolved promptly upon identification.

Data Analysis: Data were analyzed using SPSS version 22 (IBM Corp., Armonk, NY, USA). Descriptive statistics, including frequencies and percentages, were calculated for demographic variables and airway assessment scores. The frequency of difficult airway was determined based on the predefined classification criteria used in the study. The chi-square test was applied to assess associations between demographic variables and airway difficulty. A p-value of <0.05 was considered statistically significant.

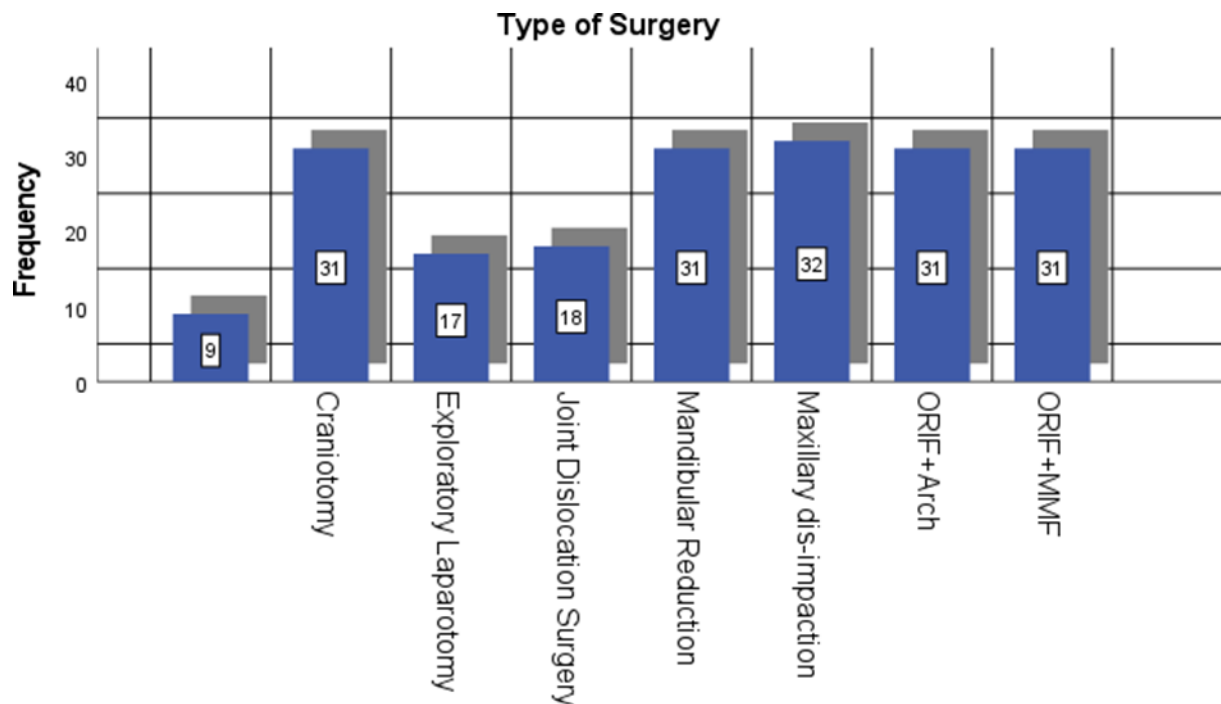
RESULTS: The study involved 196 patients, and data was obtained from multiple emergency surgery theaters. All patients were classified under ASA Class E, highlighting the emergency nature of these cases. Among the participants, the majority were male, making up 73.0% (146 cases), while female patients accounted for 22.5% (45 cases). These results emphasize a predominantly male representation in the study sample from emergency settings as shown in figure.

Patient Gender



Among the various emergency procedures analyzed, maxillary dis-impaction stood out as the most frequently performed surgery, representing 16% (32 cases) of the total. Craniotomy, mandibular reduction, and ORIF + Arch closely followed, each accounting for 15.5% (31 cases). Exploratory laparotomy, on the other hand, was the

least common, contributing 8.5% (17 cases) to the total sample. These findings offer a detailed insight into the surgical trends within emergency settings.



The Mallampati Score distribution indicates that the majority of patients, 60.2% (115 cases), were classified as Class III, followed by 26.2% (50 cases) in Class II. Class I was observed in 7.9% (15 cases), while Class IV had the lowest representation at 5.8% (11 cases). These findings suggest that the majority of cases fell into the higher difficulty classes.

For the Thyromental Score, most patients (60.7%, 116 cases) had a score of less than 6 cm, indicating a higher likelihood of a difficult airway. This was followed by 20.4% (39 cases) in the 6–6.5 cm range, 11.0% (21 cases) with less than 5 cm, and 7.9% (15 cases) with scores greater than 6.5 cm.

The Mouth Opening Score revealed that 59.7% (114 cases) had a mouth opening of 4 cm, with 16.8% (32 cases) opening less than 4 cm. Meanwhile, 15.7% (30 cases) exhibited a mouth opening of less than 5 cm, and only 7.9% (15 cases) exceeded 5 cm. This indicates a predominance of cases with reduced mouth opening, further complicating airway management.

Table 4.1 Distribution of Airway Classification Parameters in Emergency Surgery Patients

Parameter	Category	Frequency	Percent
Mallampati Score	I	15	7.5%
	II	50	25.0%
	III	115	57.5%
	IV	11	5.5%
	Total	191	95.5%

Thyromental Score	> 6.5 cm	15	7.5%
	6 – 6.5 cm	39	19.5%
	< 6 cm	116	58.0%
	< 5 cm	21	10.5%
	Total	191	95.5%
Mouth Opening	> 5 cm	15	7.5%
	< 5 cm	30	15.0%
	4 cm	114	57.0%
	< 4 cm	32	16.0%
	Total	191	95.5%
Optimum Airway	Optimal	9	4.5%
	Difficult	89	44.5%
	Moderate	44	22.0%
	Very Difficult	58	29.0%
	Total	200	100.0%

In terms of airway management, 44.5% (89 cases) were categorized as difficult, with 29.0% (58 cases) classified as very difficult, highlighting the challenges in securing an airway in emergency settings. Moderate difficulty was noted in 22.0% (44 cases), while only 4.5% (9 cases) were considered optimal.

In our study, the majority of cases fell under specific classifications for each parameter. For the Mallampati Score, most patients were classified as Class III, comprising 57.5% (115 cases) of the total. In terms of the Thyromental Score, < 6 cm was the most common, accounting for 58.0% (116 cases). For Mouth Opening, the majority of cases were in the 4 cm category, representing 57.0% (114 cases). Lastly, for Optimum Airway, the classification of Difficult was the most prevalent, with 44.5% (89 cases) of patients falling into this category. These findings highlight the prevalence of airway difficulty in the study sample, emphasizing the need for careful airway management in emergency settings.

DISCUSSION:

This study evaluated the airway categorization of emergency surgery patients using four essential parameters: Mallampati Score, Thyromental Score, Mouth Opening, and Optimum Airway. The findings shed light on the distribution of these parameters in ASA Class E patients, underlining the difficulty of airway care in emergency scenarios. The majority of patients (57.5%) were classed as Mallampati Class III, indicating a greater risk of difficult intubation. This conclusion is consistent with previous research that has found a greater occurrence of difficult airways in emergency situations, particularly those involving trauma or critically sick patients. According to research,

patients in higher Mallampati classes are more likely to have trouble intubating since the oral and pharyngeal structures are less visible. Goudra et al. (2013) found that patients in Mallampati Classes III and IV have a higher probability of difficult intubation. These findings emphasize the necessity of completing full airway examinations in emergency situations, as a considerable number of patients come with airway issues, which can complicate therapy (2).

In terms of the Thyromental Score, the majority of patients (58%) had a Thyromental Distance of less than 6 cm, which is frequently associated with a higher risk of difficult airway management. A shortened Thyromental distance indicates limited neck extension or restricted oral opening, both of which might increase the risk of problems during intubation. The results of this study are consistent with those of Goh et al. (2009), who found that a shorter Thyromental distance is a substantial predictor of difficult intubation. In emergency settings, where time is frequently limited and swift decision-making is critical, the Thyromental Score can give useful insight into prospective airway issues, suggesting the need for alternate approaches or preparedness for a difficult airway (4).

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The study found that 44.5% of patients had a "Difficult" airway, while 29.0% had a "Very Difficult" airway. This large number of individuals with difficult or extremely difficult airways emphasizes the difficulty of establishing an airway in an emergency. Previous research has shown that airway treatment in emergency situations, particularly in trauma patients, is frequently more challenging than elective surgery. Hagberg et al. (2017) and Moller et al. (2019) found that individuals with trauma or severe illness had more difficult or extremely difficult airways. Given the significant number of individuals with problematic airways in our research, healthcare professionals must be prepared (7)(8).

The results of this study are consistent with prior research on the occurrence of difficult airways in emergency settings. Sakles et al. (2013) found that Mallampati Class III and IV scores, as well as shortened Thyromental distance and restricted mouth opening, are often observed in emergency department patients. This underscores the idea that airway difficulties are a common issue in emergency treatment, demanding prompt and thorough airway assessment. Furthermore, it emphasizes the necessity for doctors to be well-prepared for handling difficult airways, because these patients are at a greater risk of complications such as hypoxia, aspiration, or unsuccessful intubation (9).

CONCLUSION:

The high prevalence of difficult airways in emergency surgery patients underscores the critical need for thorough preoperative airway assessment and preparation. In this study, a considerable number of patients were categorized as Mallampati Class III, with a Thyromental Distance of less than 6 cm and restricted mouth opening, all of which indicate a higher risk of airway management issues. These findings emphasize the need of predicting potential challenges in emergency situations, where prompt and effective actions are required. Given the increased likelihood of difficult intubation and airway problems, healthcare practitioners must be prepared with sophisticated procedures and tactics to maintain patient safety and enhance outcomes in such critical situations.

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