



Original Article

Endotracheal Intubation Practices, Success Rate, Difficult Intubation, and Immediate Complications in an Emergency Department of a Tertiary Care Hospital

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ABSTRACT

Objective: This study aimed to assess the indications for endotracheal intubation, success rate, difficult intubation rate, reasons for difficult intubation, agents used, number of attempts, alternative techniques, and immediate complications of endotracheal intubation in the emergency department.

Methods: This prospective observational study included 300 adult patients who underwent endotracheal intubation in the emergency medicine department of a tertiary care hospital from July 2023 to December 2024. Patients older than 18 years intubated during observer duty hours were included. Patients with apparent difficult airway features, severe obesity, pregnancy, facial maxillary trauma, neck swelling, disturbed facial anatomy, or one finger mouth opening were excluded. Data on demographic profile, indication, performer level, induction and paralytic agents, attempts, difficult intubation, alternate techniques, and immediate complications were recorded and analyzed.

Results: Mean age was 56.22 years, and 197 patients (65.67%) were male. Non-traumatic indications accounted for 237 intubations (79.00%), while traumatic indications accounted for 63 (21.00%). The commonest non-traumatic indication was cardiac arrest (57, 24.05%), and the commonest traumatic indication was head injury (42, 66.67%). The overall success rate was 99.67%. First attempt success was 63.67%. Difficult intubation occurred in 51 patients (17.00%), most commonly due to obesity (26, 50.98%). Complications occurred in 29 patients (9.66%), with desaturation being the most common.

Conclusion: Emergency department endotracheal intubation demonstrated a high overall success rate with an acceptable rate of immediate complications.

Keywords: Endotracheal intubation, emergency department, difficult airway, first attempt success, desaturation, airway management.

INTRODUCTION

The emergency department is often the first point of contact for critically ill patients who require immediate stabilization before a final diagnosis is established.^[1] Emergency airway management is, therefore, one of the most important resuscitative procedures in emergency medicine. Endotracheal intubation is considered a definitive airway intervention and remains a standard method for securing the airway, maintaining ventilation, improving oxygenation, and protecting against aspiration.^[2,3]

Emergency department intubation differs from elective airway management because patients are often physiologically unstable, recently fed, traumatized, hypoxic, or hemodynamically compromised. These factors increase the chance of

difficult intubation and immediate complications. Previous emergency department studies have reported variable first attempt success rates, difficult intubation rates, drug use patterns, and adverse event rates.^[4-8] Rapid sequence intubation has also been associated with higher first-attempt success in emergency airway care.^[9]

The present study was conducted to evaluate emergency department endotracheal intubation practices in a tertiary care hospital, with a special focus on indications, success rate, difficult intubations, reasons for difficult intubations, number of attempts, alternative techniques, and immediate complications. The thesis source confirms the study aim, methodology, and result variables.

METHODS

Study design and setting

This was a prospective observational study conducted in the Department of Emergency Medicine, Narendra Modi Medical College and Sheth L.G. General Hospital, Ahmedabad, Gujarat, India. The study was initiated after obtaining approval from the Institutional Ethics Committee. Written informed consent was obtained from the relatives of all eligible patients before inclusion in the study.

Study period and sample size

The study was conducted from July 2023 to December 2024. A total of 300 adult patients undergoing endotracheal intubation in the emergency department were included. The thesis methodology states that the study was prospective and observational, with 300 patients included by convenience sampling.

Inclusion criteria

Patients aged 18 years or older who were intubated in the emergency department during observer duty hours and whose relatives provided written informed consent were included.

Exclusion criteria

Patients with apparent difficult endotracheal intubation were excluded, including those with one-finger mouth opening, disturbed facial anatomy, neck swelling, facial maxillary trauma, severe obesity, and pregnancy.

Procedure and data collection

Intubations were performed by trained residents or faculty members of the emergency medicine department. Data were collected on age, sex, indication for intubation, level of the intubating physician, induction agent, paralytic agent, number of attempts, use of an alternate technique, reasons for difficult intubation, and immediate complications. Pre-intubation and post-intubation vitals were monitored using a multipara monitor.

Definitions

An intubation attempt was defined as the insertion and removal of the laryngoscope from the oral cavity, regardless of whether an endotracheal tube was inserted. Difficult endotracheal intubation was defined as intubation requiring more than 2 attempts. A trained resident was defined as one who had performed 25 supervised and 5 independent intubations.

Statistical analysis

Data were entered into Microsoft Excel and analyzed using IBM SPSS Statistics version 29.0. Categorical variables were expressed as frequencies and percentages. Continuous variables were expressed as mean and standard deviation, where applicable.

RESULTS

A total of 300 patients were included. The mean age was 56.22 years, with the largest age group being 51 to 60 years (68, 22.67%), followed by 61 to 70 years (60, 20.00%) [Figure 1]. Male patients were 197 (65.67%), and female patients were 103 (34.33%) [Figure 2]. Most intubations were performed by second-year residents (200, 66.67%), followed by first-year residents (56, 18.67%).

Figure 1: Age distribution

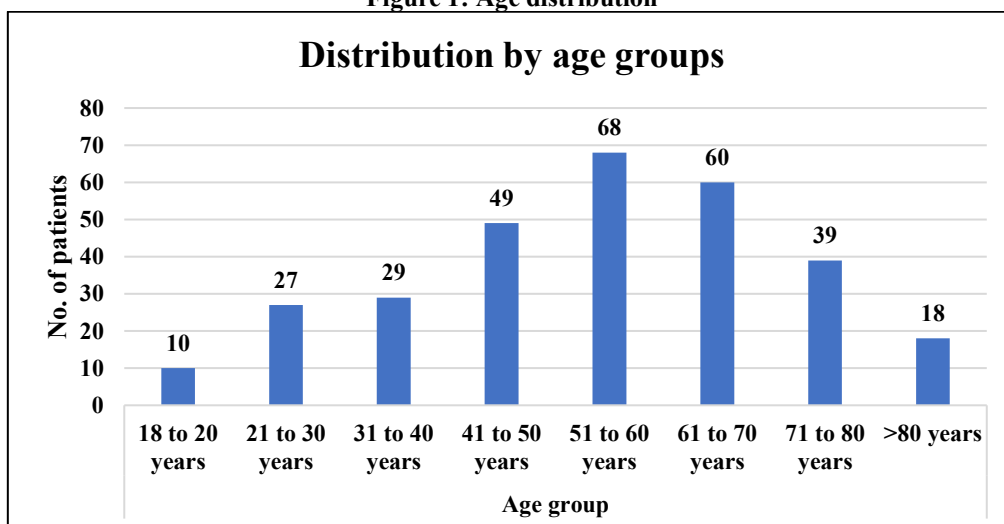
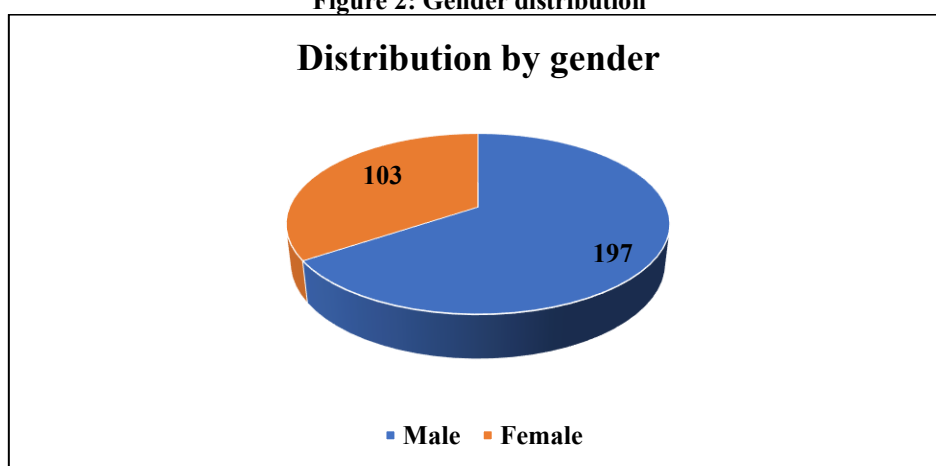


Figure 2: Gender distribution



Non-traumatic indications were present in 237 patients (79.00%), while traumatic indications were present in 63 patients (21.00%) [Figure 3]. Among non-traumatic indications, cardiac arrest was most common (57, 24.05%), followed by respiratory failure (55, 23.21%), altered mental status (37, 15.61%), intracranial hemorrhage (31, 13.08%), and poisoning (25, 10.55%). Among traumatic indications, head injury was most common (42, 66.67%), followed by hypovolemic shock (8, 12.70%) and blunt chest trauma (6, 9.52%) [Table 1].

Figure 3: Distribution by indication

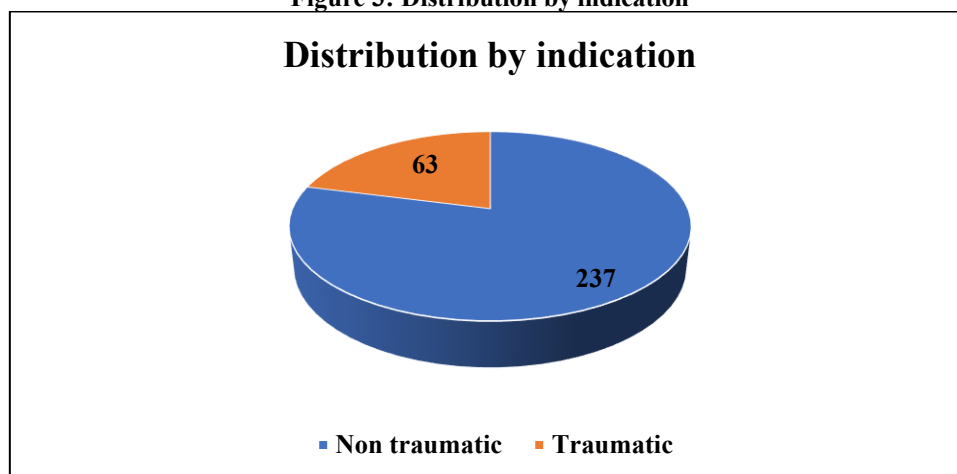


Table 1: Indication of endotracheal intubation

Indication	n	%
Cardiac arrest	57	24.1

Non-traumatic indication	Respiratory failure	55	23.2
	Altered mental status	37	15.6
	Intracranial hemorrhage	31	13.1
	Poisoning	25	10.6
	Stroke	16	6.75
	Seizure	11	4.64
	Airway obstruction	4	1.69
	Anaphylaxis	1	0.42
Traumatic indication	Head injury	42	66.7
	Hypovolemic shock	8	12.7
	Blunt chest trauma	6	9.52
	Cervical spine trauma	3	4.76
	Burn	1	1.59
	Drowning	1	1.59
	Face trauma	1	1.59
	Penetrating chest trauma	1	1.59

Table 2. Drugs used, number of attempts, difficult intubation, and alternate techniques

Variable	Category	n	%
Induction agent	Propofol	103	34.3
	Midazolam	81	27
	Etomidate	59	19.7
	None	57	19
Paralytic agent	Succinylcholine	30	10
	None	270	90
Number of attempts	1	191	63.7
	2	58	19.3
	3	50	16.7
	Failed	1	0.33
Difficult intubation	No	249	83
	Yes	51	17
Reason for difficult intubation	Obesity	26	51
	Airway injury	14	27.5
	Airway edema	4	7.84
	Restricted neck movement	4	7.84
	High arched palate	1	1.96
	Prominent teeth	1	1.96
	Tongue deformity	1	1.96
		1	1.96
Alternate technique	BURP maneuver	53	72.6
	Bougie	15	20.6
	Supraglottic airway	4	5.48
	Cricothyroidotomy	1	1.37

Figure 4: Complication distribution

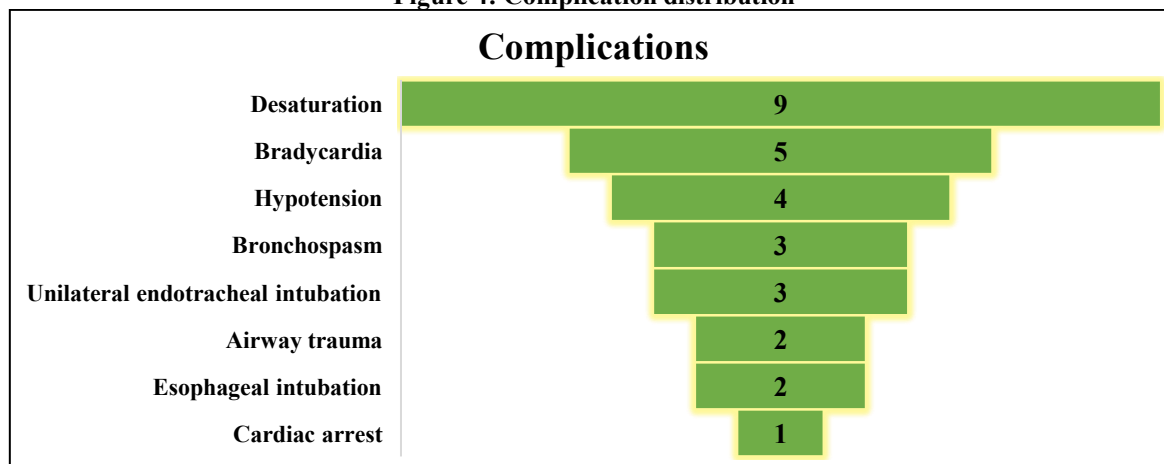


Table 2 describes the drugs used, the number of attempts, difficult intubation, and alternate techniques. Propofol was the commonest induction agent (103, 34.33%), followed by midazolam (81, 27.00%) and etomidate (59, 19.67%). No induction agent was used in 57 patients (19.00%). Succinylcholine was used in 30 patients (10.00%). Difficult intubation occurred in 51 patients (17.00%). The most common reason was obesity (26, 50.98%), followed by airway injury (14, 27.46%), airway edema (4, 7.84%), and restricted neck movement (4, 7.84%). First-attempt success was achieved in 191 patients (63.67%), second-attempt success in 58 patients (19.33%), and third-attempt success in 50 patients (16.67%). One intubation failed (0.33%), giving an overall success rate of 99.67%. Alternate techniques were used in 73 patients. The BURP maneuver was the most common (53, 72.60%), followed by bougie (15, 20.55%), supraglottic airway (4, 5.48%), and cricothyroidotomy (1, 1.37%).

As seen in Figure 4, immediate complications occurred in 29 patients (9.66%). The most common complication was desaturation (9, 31.03%), followed by bradycardia (5, 17.25%), hypotension (4, 13.79%), bronchospasm (3, 10.34%), unilateral endotracheal intubation (3, 10.34%), airway trauma (2, 6.90%), esophageal intubation (2, 6.90%), and cardiac arrest (1, 3.45%).

DISCUSSION

In this prospective observational study of 300 emergency department intubations, the overall intubation success rate was 99.67%, while the first-attempt success rate was 63.67%. Most patients were intubated for non-traumatic indications, and the commonest non-traumatic indication was cardiac arrest. Among traumatic cases, head injury was the leading indication. The mean age in the present study was 56.22 years. This is close to the findings of Fogg et al.^[5] and Linu et al.^[6], but lower than Bernhard et al.^[10] and Yildirim et al.^[8]. Male predominance was observed, with 65.67% of patients being male. This was comparable to previous emergency intubation studies by Sakles et al.^[11], Fogg et al.^[5], Jadav^[12], Linu et al.^[6], and Yildirim et al.^[8].

The predominance of non-traumatic indications in this study is consistent with several previous reports on emergency department intubation.^[8,12–14] Cardiac arrest and respiratory failure were the 2 leading non-traumatic causes. This reflects the critical nature of emergency airway intervention, in which airway control is often required during resuscitation or respiratory support. In traumatic cases, head injury was the commonest indication, which is clinically expected because airway protection and ventilation support are central to the management of severe traumatic brain injury.

Propofol was the most frequently used induction agent in the present study. This pattern is comparable to reports by Jadav^[12] and Linu et al.^[6], although drug preference varies across institutions depending on patient physiology, physician preference, drug availability, and local emergency airway protocols. Midazolam and etomidate were also commonly used. Succinylcholine use was low at 10.00%, suggesting limited use of paralytic assisted intubation in this setting. Previous evidence suggests that rapid sequence intubation may improve first attempt success without increasing complications. So, structured airway protocols may improve future performance.^[9]

The first attempt success rate in this study was 63.67%, lower than the rates reported by Fogg et al.^[5], Jadav^[12], and Yildirim et al.^[8]. However, the overall success rate was very high at 99.67%. This means that most failures on the first attempt were resolved with repeat attempts or alternative airway techniques. Because multiple attempts are associated with complications, improving first-attempt success should remain an important quality target.

Difficult intubation was observed in 17.00% of cases. This was close to the rate reported by Kim et al.^[15] but higher than those reported by Fogg et al.^[5], Prakash et al.^[16], and Jadav^[12]. Obesity was the leading reason for difficult intubation, followed by airway injury. This agrees with prior literature showing that obesity and airway pathology can reduce first-attempt success and increase adverse events.^[17–19]

Immediate complications occurred in 9.66% of patients. This rate was comparable to that reported by Choi et al.^[20] and lower than that reported in several studies with higher complication rates^[4–8]. Desaturation was the commonest complication. This is clinically important because emergency patients often have poor oxygen reserve before intubation. Preoxygenation, hemodynamic optimization, use of airway adjuncts, and early recognition of difficult airway features may help reduce complications.

The main strength of this study is its prospective design and inclusion of 300 emergency department intubations. It provides useful data from an Indian tertiary care emergency department. The major limitations include a single-center design, convenience sampling, exclusion of some apparently difficult airway cases, and a lack of long-term patient outcome assessment. The study also did not evaluate the association between operator level, drug choice, number of attempts, and complications using inferential statistics.

CONCLUSION

Emergency department endotracheal intubation at this tertiary care hospital had an overall success rate of 99.67%. First-attempt success was 63.67%, and 17.00% of patients had difficult intubations. Non-traumatic indications were more

common than traumatic indications. Cardiac arrest was the most common non-traumatic indication, and head injury was the most common traumatic indication. Propofol was the most common induction agent. Immediate complications occurred in 9.66% of patients, with desaturation being the most common. Training, airway preparedness, improved first-attempt planning, and protocol-based airway management may further improve the quality of emergency intubation.

Conflict of Interest

The authors declare no conflicts of interest regarding this study.

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REFERENCES

- Goto, T., Goto, Y., Hagiwara, Y., Okamoto, H., Watase, H., & Hasegawa, K. (2019). Advancing emergency airway management practice and research. *Acute Medicine & Surgery*, 6(4), 336–351.
- Wang, H. E., & Carlson, J. N. (2020). Tracheal intubation. In J. E. Tintinalli, O. J. Ma, D. M. Yealy, G. D. Meckler, J. S. Stapczynski, D. M. Cline, & S. H. Thomas (Eds.), *Tintinalli's emergency medicine: A comprehensive study guide* (9th ed., pp. 179–189). McGraw Hill Education.
- American College of Surgeons Committee on Trauma. (2018). Airway and ventilatory management. In *Advanced trauma life support student course manual* (10th ed., pp. 22–42). American College of Surgeons.
- Fathil, S. M., Mohd Mahdi, S. N., Che'Man, Z., Hassan, A., Ahmad, Z., & Ismail, A. K. (2010). A prospective study of tracheal intubation in an academic emergency department in Malaysia. *International Journal of Emergency Medicine*, 3(4), 233–237.
- Fogg, T., Annesley, N., Hitos, K., & Vassiliadis, J. (2012). Prospective observational study of the practice of endotracheal intubation in the emergency department of a tertiary hospital in Sydney, Australia. *Emergency Medicine Australasia*, 24(6), 617–624.
- Linu, S. M., Sivam, R., Paul, N., George, M. P., & Babu, S. (2021). Endotracheal intubations in emergency department: A clinical audit at a tertiary health centre in South India. *Albanian Journal of Trauma and Emergency Surgery*, 5(2), 842–848.
- Tamilarasu, K. P., Aazmi, A., Vinayagam, S., Rajendran, G., Patel, S., & Aazmi, B. (2023). A prospective observational study of endotracheal intubation practices in an academic emergency department of a tertiary care hospital in South India. *Cureus*, 15(3), e36072.
- Yildirim, M. K., Göksu, E., & El Warea, M. (2023). Evaluation of endotracheal intubations in the emergency department of a tertiary care facility. *Turkish Journal of Emergency Medicine*, 23(2), 82–87.
- Okubo, M., Gibo, K., Hagiwara, Y., Nakayama, Y., & Hasegawa, K. (2017). The effectiveness of rapid sequence intubation versus non rapid sequence intubation in emergency department: An analysis of a multicenter prospective observational study. *International Journal of Emergency Medicine*, 10, Article 1.
- Bernhard, M., Bax, S. N., Hartwig, T., Yahiaoui-Doktor, M., Petros, S., Bercker, S., Ramshorn-Zimmer, A., & Gries, A. (2019). Airway management in the emergency department: The OcEAN study, a prospective single centre observational cohort study. *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine*, 27, Article 20.
- Sakles, J. C., Laurin, E. G., Rantapaa, A. A., & Panacek, E. A. (1998). Airway management in the emergency department: A one year study of 610 tracheal intubations. *Annals of Emergency Medicine*, 31(3), 325–332.
- Jadav, P. (2013). Study of endotracheal intubation in emergency room of a tertiary care hospital of Ahmedabad City of Gujarat, India. *International Journal of Scientific Research*, 2(12), 363–366.
- Kim, J. H., Kim, Y. M., Choi, H. J., Je, S. M., & Kim, E. (2013). Factors associated with successful second and third intubation attempts in the emergency department. *The American Journal of Emergency Medicine*, 31(9), 1376–1381.
- Alkhour, H., Vassiliadis, J., Murray, M., Mackenzie, J., Tzannes, A., McCarthy, S., & Fogg, T. (2017). Emergency airway management in Australian and New Zealand emergency departments: A multicentre descriptive study of 3,710 emergency intubations. *Emergency Medicine Australasia*, 29(5), 499–508.
- Kim, C., Kang, H. G., Lim, T. H., Choi, B. Y., Shin, Y. J., & Choi, H. J. (2013). What factors affect the success rate of the first attempt at endotracheal intubation in emergency departments? *Emergency Medicine Journal*, 30(11), 888–892.
- Prakash, S., Kumar, A., Bhandari, S., Mullick, P., Singh, R., & Gogia, A. R. (2013). Difficult laryngoscopy and intubation in the Indian population: An assessment of anatomical and clinical risk factors. *Indian Journal of Anaesthesia*, 57(6), 569–575.
- Yakushiji, H., Goto, T., Shirasaka, W., Hagiwara, Y., Watase, H., Okamoto, H., & Hasegawa, K. (2018). Associations of obesity with tracheal intubation success on first attempt and adverse events in the emergency department: An analysis of the multicenter prospective observational study in Japan. *PLOS ONE*, 13(4), e0195938.
- Agrawal, S. K., Singh, S., & Kashyap, R. (2024). Study of the factors affecting difficult endotracheal intubation among patients presenting to the emergency department in Ramkrishna Care Hospital, Raipur, Chhattisgarh. *International Journal of Advanced Research*, 12(3), 264–275.

19. Wong, E., & Ng, Y. Y. (2008). The difficult airway in the emergency department. *International Journal of Emergency Medicine*, 1(2), 107–111.
20. Choi, Y. F., Wong, T. W., Lau, C. C., Siu, A. Y. C., Lo, C. B., Yuen, M. C., Tung, W. K., Ng, P., Kam, C. W., Mui, T. K., Yuen, W. L., Lim, B., & Lit, A. C. H. (2003). A study of orotracheal intubation in emergency departments of five district hospitals in Hong Kong. *Hong Kong Journal of Emergency Medicine*, 10(3), 138–145.