RJNMSR
Review Journal of Neurological & Medical Sciences Review

Volume 4, Issue 4, 2026

FREQUENCY OF POST-TRACHEOSTOMY COMPLICATIONS IN INTENSIVE CARE UNIT PATIENTS

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DOI: https://doi.org/

Keywords:
Frequency, Post-Tracheostomy, Complications, and Intensive Care Units

Article History
Received on 12 March, 2026
Accepted on 02 April, 2026
Published on 03 April, 2026

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Abstract

Background: Tracheostomy is a commonly performed procedure in intensive care unit (ICU) patients requiring prolonged airway support or mechanical ventilation. Although it provides several clinical benefits, it may be associated with a range of early and late complications that can increase patient morbidity and affect clinical outcomes. Objective: To determine the frequency of post-tracheostomy complications in intensive care unit patients. Methods: A prospective observational study was conducted among 61 ICU patients who underwent surgical tracheostomy at Lady Reading Hospital and Hayatabad Medical Complex, Peshawar, between July and December 2024. Patients were followed daily for the occurrence of post-tracheostomy complications. Data were collected using a structured questionnaire and analyzed in SPSS version 22.0 using descriptive statistics and chi-square test. A p-value <0.05 was considered statistically significant. Results: A total of 61 ICU patients who underwent tracheostomy were included in the study. Among them, 57.4% were male and 42.6% were female, with the majority aged 20–40 years (42.6%). The most common post-tracheostomy complication was ventilator-associated pneumonia (14.8%), followed by bleeding complications (9.8%). Pneumothorax and tracheoesophageal fistula were each observed in 6.6% of patients, while subcutaneous emphysema, sepsis, and cardiopulmonary arrest occurred in 4.9% of patients. Less frequent complications included vocal cord paralysis (3.3%), difficulty in speaking (1.6%), accidental Decannulation (1.6%), laryngeal edema (1.6%), and difficulty in swallowing (1.6%). No case of tracheal stenosis was observed. Conclusion: Post-tracheostomy complications were not uncommon among ICU patients, with ventilator-associated pneumonia and bleeding being the most frequent complications. Early recognition and standardized post-tracheostomy care may help reduce complication rates and improve patient outcomes in critically ill patients.

Introduction

Tracheostomy is a commonly performed procedure in critically ill patients requiring prolonged airway support and mechanical ventilation. It involves creating an opening in the anterior wall of the trachea to establish a secure airway (1). In intensive care units (ICUs), tracheostomy is frequently performed to facilitate prolonged ventilation, assist in secretion clearance, reduce laryngeal injury caused by prolonged endotracheal intubation, improve patient comfort, and support weaning from mechanical ventilation (2). Tracheostomy may be performed using either a surgical tracheostomy (ST) or percutaneous dilatational tracheostomy (PDT) technique. Over recent decades, percutaneous tracheostomy has become increasingly popular in ICU settings because it can be performed at the bedside and is generally considered a safe and effective alternative to surgical tracheostomy in selected patients. The choice of technique usually depends on patient condition, anatomical considerations, and clinician expertise (4). Despite its clinical benefits, tracheostomy is associated with a range of early and late complications. Early complications may include bleeding, tube obstruction, accidental decannulation, pneumothorax, subcutaneous emphysema, wound infection, and loss of airway, whereas late complications may include tracheal stenosis, tracheoesophageal fistula, granulation tissue formation, and vocal cord dysfunction. Some of these complications may increase morbidity, prolong ICU stay, and adversely affect patient outcomes if not identified and managed promptly (5). Although tracheostomy is a routine ICU procedure, the frequency and pattern of post-tracheostomy complications may vary depending on patient-related factors, timing of the procedure, indication, and post-procedural care. Identifying the common complications associated with tracheostomy is important for improving airway management, patient safety, and ICU care practices. Therefore, the present study was conducted to determine the frequency of post-tracheostomy complications in intensive care unit patients.

Materials and Methods

A prospective observational study was conducted in the intensive care units of Lady Reading Hospital and Hayatabad Medical Complex, Peshawar, from July 2024 to December 2024. The study included 61 ICU patients who underwent surgical tracheostomy during their ICU stay. Patients with a pre-existing tracheostomy, those who were brain dead, and those with do-not-resuscitate (DNR) status were excluded. A non-probability convenience sampling technique was used. Data were collected using a structured proforma after obtaining informed consent from the patient's attendant. Information regarding demographic characteristics, tracheostomy-related details, and post-tracheostomy complications was recorded. Each patient was followed daily during the ICU stay for the development of complications. Data were analyzed using SPSS version 22.0. Results were presented as frequencies and percentages, and the chi-square test was applied where appropriate. A p-value <0.05 was considered statistically significant.

Results

A total of 61 intensive care unit patients who underwent tracheostomy were included in the study. Of these, 35 (57.4%) were male, and 26 (42.6%) were female. The majority of patients belonged to the 20–40 years age group (42.6%), followed by 1–20 years (32.8%), 40–60 years (18.0%), and >60 years (6.6%). The mean age of the participants was 30 years.

Table 1: ***Demographic characteristics***

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	35	57.4
	Female	26	42.6
Age Group	1–20 years	20	32.8
	20–40 years	26	42.6
	40–60 years	11	18.0
	>60 years	4	6.6

Post-tracheostomy complications were recorded prospectively during ICU follow-up. The most frequent complication was ventilator-associated pneumonia (14.8%), followed by bleeding complications (9.8%). Pneumothorax and tracheoesophageal fistula were each documented in 6.6% of patients. Subcutaneous emphysema, sepsis, and cardiopulmonary arrest were each observed in 4.9% of cases, while vocal cord paralysis occurred in 3.3%. Less common complications included difficulty in speaking, accidental decannulation, laryngeal edema, and difficulty in swallowing, each occurring in 1.6% of patients. Notably, no patient developed tracheal stenosis during the observation period.

Table 2: ***Frequency of Post-Tracheostomy complications***

S. No.	Complication	Yes, n (%)	No, n (%)
1	Pneumothorax	4 (6.6)	57 (93.4)
2	Subcutaneous emphysema	3 (4.9)	58 (95.1)
3	Bleeding complications	6 (9.8)	55 (90.2)
4	Difficulty in speaking	1 (1.6)	60 (98.4)
5	Sepsis	3 (4.9)	58 (95.1)
6	Accidental decannulation	1 (1.6)	60 (98.4)
7	Tracheal stenosis	0 (0.0)	61 (100.0)
8	Laryngeal edema	1 (1.6)	60 (98.4)
9	Difficulty in swallowing	1 (1.6)	60 (98.4)
10	Vocal cord paralysis	2 (3.3)	59 (96.7)
11	Ventilator-associated pneumonia (VAP)	9 (14.8)	52 (85.2)
12	Cardiopulmonary arrest	3 (4.9)	58 (95.1)
13	Tracheoesophageal fistula	4 (6.6)	57 (93.4)

These findings indicate that respiratory and procedure-related complications remain clinically relevant following tracheostomy in ICU patients,

with VAP and bleeding being the most frequently encountered complications.

Discussion

The present study evaluated the frequency of post-tracheostomy complications in ICU patients and found that ventilator-associated pneumonia (14.8%) was the most frequent complication, followed by bleeding (9.8%), pneumothorax (6.6%), and tracheoesophageal fistula (6.6%). These findings indicate that respiratory and airway-related complications remain clinically relevant after tracheostomy. The predominance of VAP in the present study is consistent with previous studies reporting pneumonia as a common complication, particularly in patients with prolonged ventilation and delayed tracheostomy (1,6). Bleeding, another major finding in the present study, has also been widely reported as one of the most frequent early complications of tracheostomy (7,8). Similarly, pneumothorax and subcutaneous emphysema observed in the present study are recognized procedural complications described in previous literature (9,10). The occurrence of tracheoesophageal fistula in patients is clinically important because it represents a serious late airway complication. Comparable findings have also been reported in previous studies (6,11). Less frequent complications such as accidental decannulation, difficulty in swallowing, and vocal cord paralysis were also identified, consistent with earlier reports (12,13). No case of tracheal stenosis was observed in this study, which may be explained by the relatively short ICU-based follow-up period, as tracheal stenosis is generally a delayed complication (5). Overall, the findings emphasize the importance of daily tracheostomy assessment, infection prevention, and standardized post-tracheostomy care to reduce morbidity in ICU patients.

Conclusion

Post-tracheostomy complications were observed in ICU patients, with ventilator-associated pneumonia being the most frequent complication, followed by bleeding, pneumothorax, and tracheoesophageal fistula. Although less common, complications such as subcutaneous emphysema, sepsis, vocal cord paralysis, and accidental decannulation were also identified. No case of tracheal stenosis was observed during the study period. The findings indicate that tracheostomy, while beneficial for airway management in critically ill patients, is associated with clinically important complications that require close monitoring and timely management. Strengthening post-tracheostomy care, infection control measures, and airway monitoring practices may help reduce complication rates and improve patient safety in ICU settings.

Limitation

This study has several limitations. First, the sample size was relatively small, which may limit the generalizability of the findings. Second, the study was conducted in only two tertiary care hospitals, so the results may not fully represent other ICU settings. Third, a non-probability convenience sampling technique was used, which may introduce selection bias. Fourth, all included patients underwent surgical tracheostomy; the findings cannot be generalized to percutaneous tracheostomy. Finally, the follow-up period was limited to ICU stay, which may have led to underreporting of late complications, particularly tracheal stenosis and other delayed airway abnormalities.

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