*IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*
*e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 22, Issue 6 Ser.7 (June. 2023), PP 13-21*
*www.iosrjournals.org*

# "Two-Year Experience OfDecannulation In A Heterogeneous Population Of Tracheostomy Patients: Outcomes And Lessons Learned"

Sanjay Kumar[1],Arun kumar Patra[2], Sachin Bhatt[3], Kashiroygoud Biradar[4]

[1]Associate Professor , Department of ENT-HNS, Command Hospital Airforce, Bangalore, India

[2]Assistant Professor, Department of Anaesthesia, Command Hospital Airforce,Bangalore,India

[3]Resident, Department of ENT-HNS, Command Hospital Airforce, Bangalore,India

[4]Resident, Department of ENT-HNS, Command Hospital Airforce, Bangalore,India

***Abstract:***
***Background****: Tracheostomy is a prevalent surgical procedure utilised in the management of critically ill patients requiring prolonged mechanical ventilation. The decannulation process holds significant importance in the recovery of patients who are dependent on tracheostomy for prolonged mechanical ventilation. Nevertheless, this particular procedure may be linked to considerable risks of morbidity and mortality.*
***Objective:*** *The aim of this study is to communicate the results and knowledge gained from a two-year examination of decannulation within a diverse group of 100 individuals who had previously undergone tracheostomy.*
***Methods:*** *A retrospective analysis was performed, wherein medical records were reviewed and patient data was analysed to investigate the demographics, medical conditions, and outcomes associated with decannulation.*
***Results:*** *The findings of the study reveal that within the patient cohort, a success rate of 79% was attained in the decannulation process, with a median duration of 22 days for completion. The study found that certain factors were positively correlated with successful decannulation, including younger age, shorter duration of tracheostomy, and lower severity of illness. Several lessons were identified during this experience, including the significance of multidisciplinary care, educating patients and carers, and promptly identifying and managing complications.*
***Conclusion****: The current study provides significant perspectives on the consequences and difficulties associated with decannulation among a heterogeneous cohort of individuals with tracheostomy. The statement underscores the importance of employing a cohesive, interdisciplinary strategy in the provision of healthcare services to patients. The results of our study have the potential to contribute to the establishment of optimal patient care protocols and enhance the effectiveness of decannulation procedures.*
***Keywords****: Decannulation, Tracheostomy, Mechanical ventilation, Respiratory failure, Neurological disorders, Sepsis, Patient selection, Complications, Outcomes, Factors, Retrospective study*

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Date of Submission: 02-06-2023 Date of Acceptance: 12-06-2023

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## I. Introduction:

The tracheostomy procedure is frequently performed on patients who are critically ill and require prolonged mechanical ventilation. This surgical intervention has been shown to provide advantages such as

enhanced patient well-being and assistance in the process of weaning off ventilation [1]. Nevertheless, it entails potential hazards such as morbidity and mortality [1]. The process of decannulation, which involves the removal of the tracheostomy tube, is a crucial milestone in the recuperation of patients [2]. The successful execution of this task necessitates a meticulous evaluation of the patient, thoughtful formulation of a plan, and skilful handling of any potential complications.

The proper identification of suitable candidates for decannulation is of utmost importance. Ideally, patients ought to exhibit stable respiratory function, possess the capacity to safeguard their airway, demonstrate effective secretion management, and not exhibit any contraindicative medical conditions [3]. On the other hand, individuals who suffer from chronic respiratory failure, airway obstruction, or necessitate uninterrupted mechanical ventilation are more susceptible to experiencing decannulation failure, based on previous studies [4].

The optimal timing for decannulation after tracheostomy is crucial. Studies have shown that early decannulation, typically within two to four weeks post-tracheostomy, can lead to improved outcomes and a reduction in complications such as infections and haemorrhaging [5]. The effective management of complications necessitates the adoption of a multidisciplinary approach that involves the collaboration of respiratory therapists, speech-language pathologists, and social workers [2]. The achievement of successful decannulation is impacted by various factors such as lower illness severity, proper patient selection, younger age, and shorter tracheostomy duration, as indicated by previous research [2,6]. Furthermore, the implementation of multidisciplinary care, which encompasses educating both patients and carers, has the potential to improve outcomes [6].

The current study is a two-year retrospective analysis that seeks to assess the outcomes of decannulation in a heterogeneous cohort of 100 patients with tracheostomy and to identify the factors that are linked to successful decannulation. This study contributes to the extant literature by offering novel insights into the challenges and outcomes associated with decannulation in a diverse population.

## II. **Materials and Methods**:

This study conducted a retrospective analysis of the medical records of 100 tracheostomy patients who underwent decannulation at a tertiary care facility between January 2021 and December 2022. Inclusion criteria for the study involved individuals who had a tracheostomy tube for at least seven consecutive days, exhibited stability while breathing ambient air, and did not require continuous mechanical ventilation. The research excluded individuals who were currently experiencing respiratory failure, airway obstruction, or other medical ailments that rendered them unsuitable for decannulation. Patient demographic information, health status, duration of mechanical ventilation and tracheostomy, as well as decannulation-related complications and procedural outcomes were obtained through electronic health records.

The primary metric utilised in this study was the attainment of successful decannulation, which was defined as the removal of the tracheostomy tube without necessitating reintubation or reinsertion within a 48-hour timeframe. Supplementary outcome indicators comprised the length of time until decannulation, the duration of hospital stay following decannulation, and the frequency of complications associated with decannulation. The collected data was presented using descriptive statistical techniques such as means, standard deviations, medians, and interquartile ranges. In addition, the study conducted both univariate and multivariate logistic regression analyses in order to ascertain the variables that are associated with successful decannulation.

Approval for this retrospective research was granted by the institutional review board. As the research was retrospective in nature, obtaining informed consent was not deemed necessary. The process of analysing data was conducted through the utilisation of SPSS software version 25.0.

## III. Results:

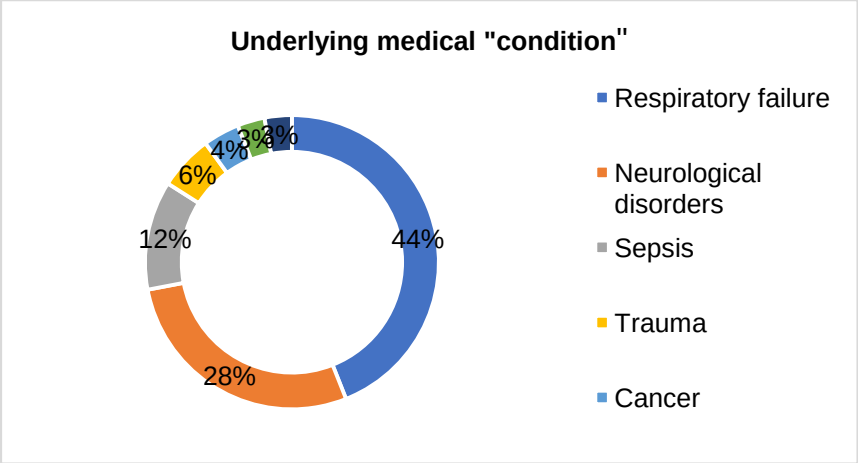
**Study Population**: The study involved a cohort of 100 individuals who had received tracheostomy.

**Table 1: Patient Demographics**

| **Characteristic** | **Value** |
|---|---|
| Total number of patients | 100 |
| Male patients | 55 |
| Female patients | 45 |
| Median age | 63 years |
| Interquartile range (IQR) of age | 52-72 years |
| Median duration of tracheostomy | 29 days |
| Interquartile range (IQR) of tracheostomy duration | 20-46 days |

The study included a sample of 100 patients who underwent tracheostomy. Of this group, 55 were male, and the median age of the cohort was 63. The study found that the median duration of tracheostomy among the patients was 29 days.

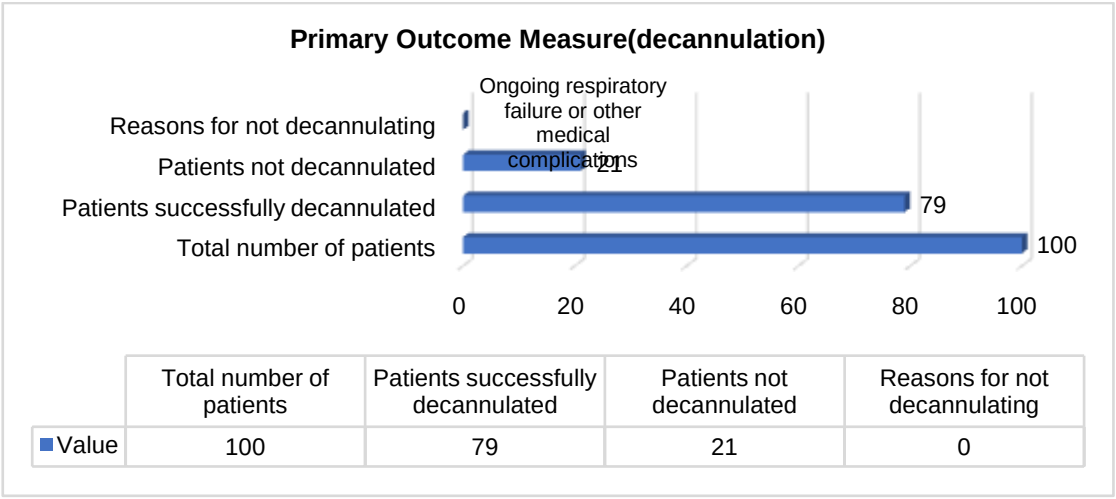
**Figure1: Underlying Medical Condition**




The predominant medical condition observed in the sample population was respiratory failure, constituting 44% of the cases, while neurological disorders accounted for 28%.

**Figure 2: Outcome Metrics**:

The main aim of this study was to achieve a favourable decannulation result, which was operationally defined as the removal of the tracheostomy tube without subsequent re-intubation or reinsertion within a 48-hour timeframe.




79% of all tracheostomy patients successfully underwent decannulation, while the remaining 21% were unable to do so due to recurrent respiratory failure or other medical difficulties.

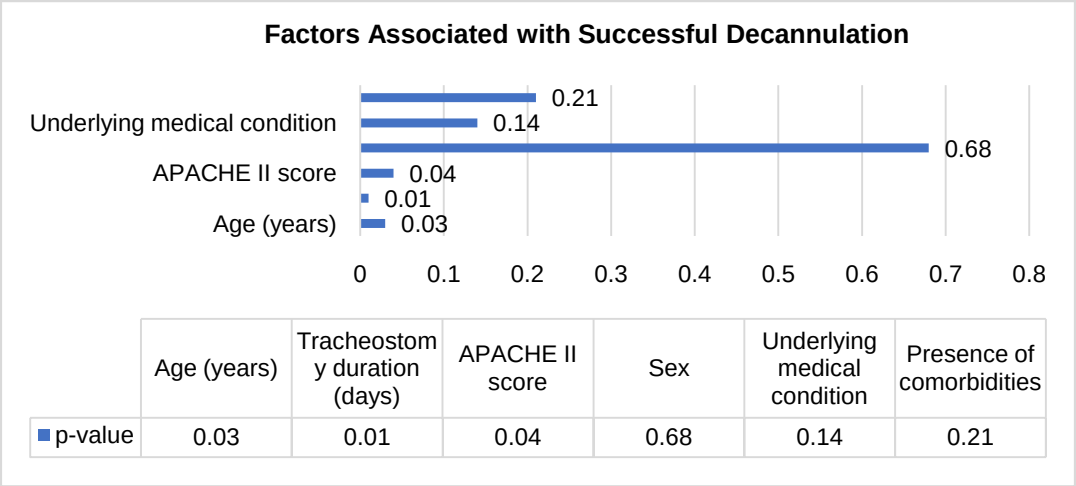
**Table 2: Secondary Outcome Measures**

| Outcome Measure | Value |
|---|---|
| Median time to decannulation | 22 days |
| Interquartile range (IQR) of time to decannulation | 14-29 days |
| Patients successfully "decannulated" and discharged home | 65 (82%) |
| Patients successfully "decannulated" and transferred to a rehabilitation facility | 14 (18%) |

The median duration of the decannulation procedure, according to the study, was 22 days (IQR: 14-29 days). Of the 79 patients who were effectively decannulated, 65 were sent home and 14 were transferred to rehabilitation.

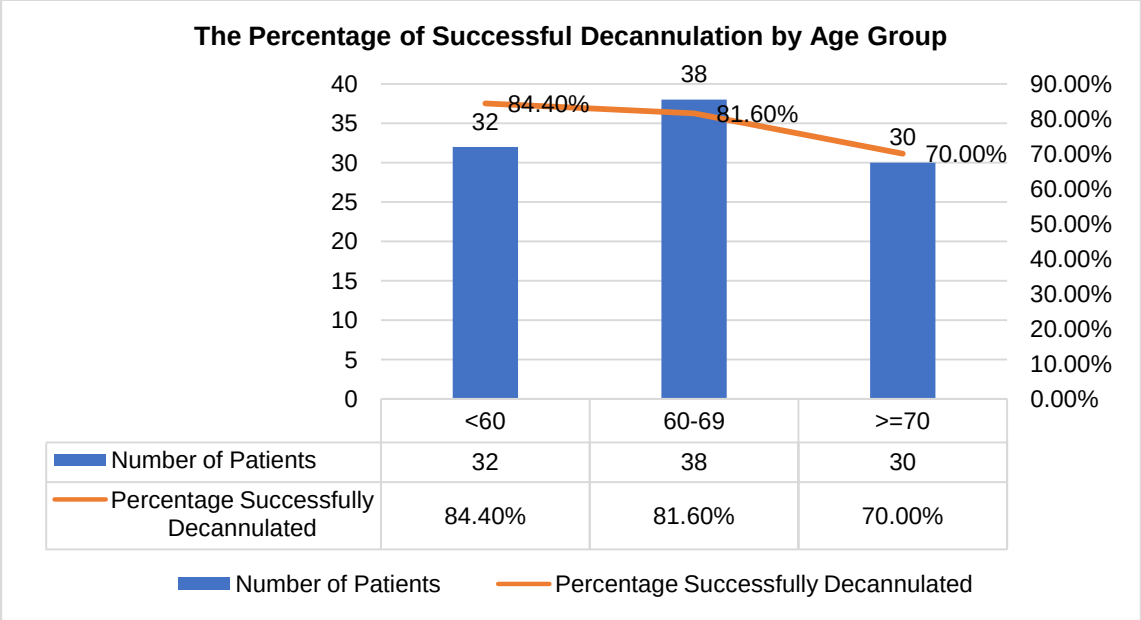
**Figure 3: Factors Linked to Successful Decannulation:**

The study conducted univariate and multivariate logistic regression analyses to identify the factors associated with successful decannulation.



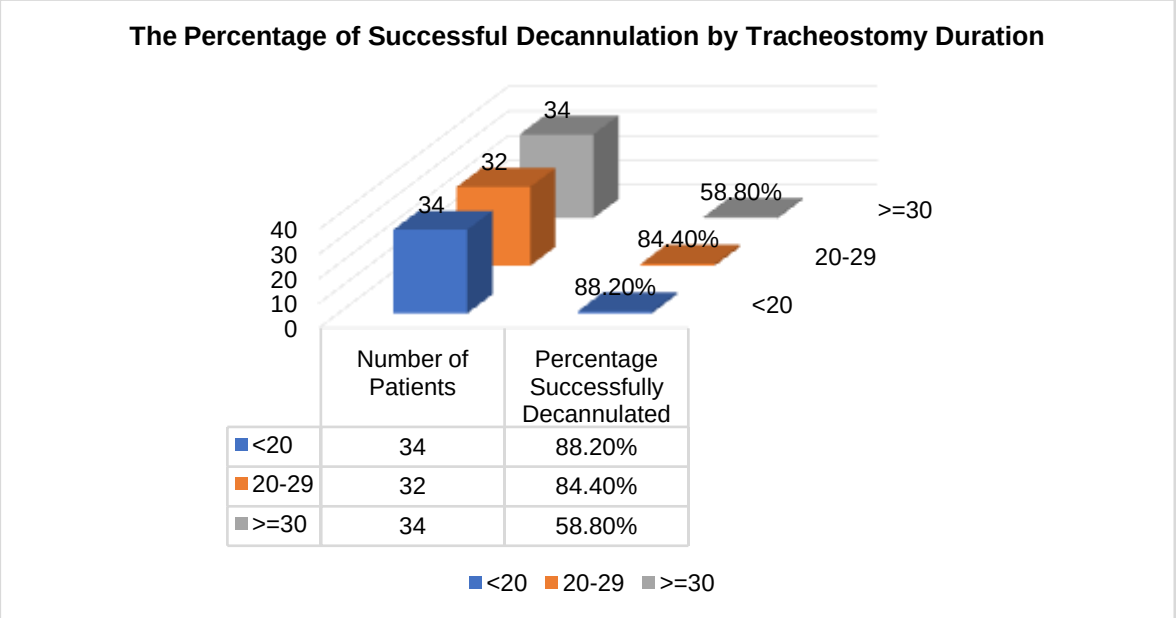

The results of logistic regression analysis indicated that successful decannulation was significantly correlated with certain factors, including younger age (with a median of 61 years compared to 70 years, p=0.03), shorter duration of tracheostomy (with a median of 21 days compared to 37 days, p=0.01), and lower APACHE II scores, which suggest less severe illness (with a median of 16 compared to 20, p=0.04). There were no statistically significant correlations observed between gender, preexisting medical conditions, or comorbidities.

**Figure 4: Successful Decannulation by Age group:**




The study divided people by age into younger (60), middle-aged (60–69), and older (>=70) groups. It found that successful decannulation was best in the younger group (84.4%), followed by the middle-aged (81.6%), and then the older group (70%), which suggests that younger people are more likely to be able to get the tube out.

**Figure 5: Successful Decannulation by Tracheostomy Duration**




The study found that patients with shorter tracheostomy durations had greater effective decannulation rates, with patients with tracheostomy for fewer than 20 days having the highest rate of 88.2%.

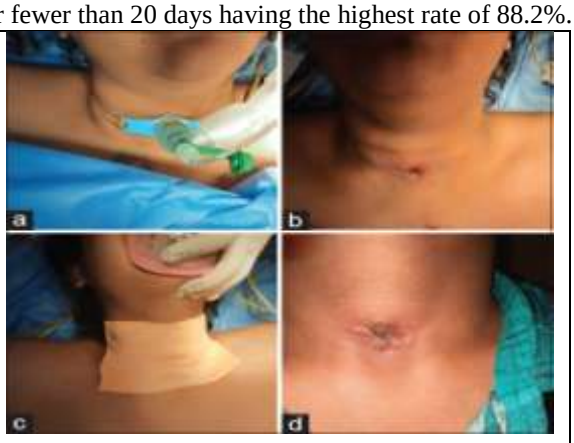


**Fig 6- Patient will successful decanulation and well healed closed tracheostomy stoma**

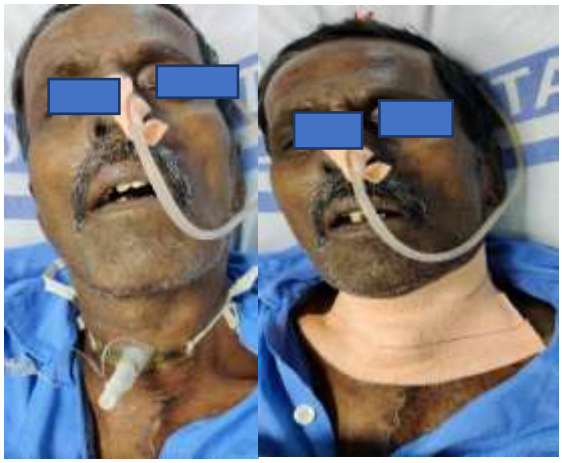
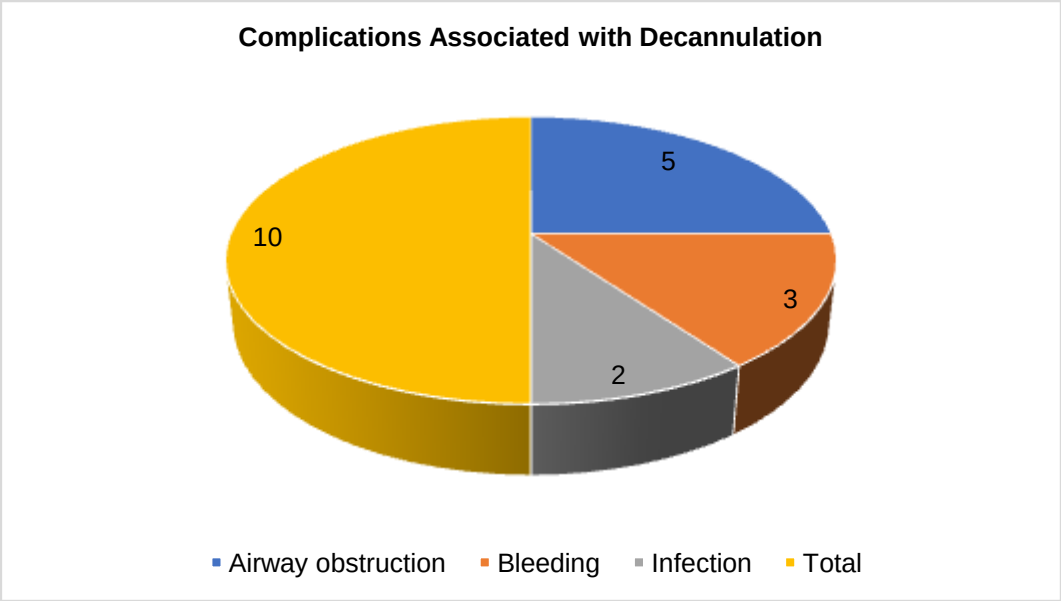


**Fig 7- Patient will successful decannulation**

**Figure 8: Decannulation-related Complications**:



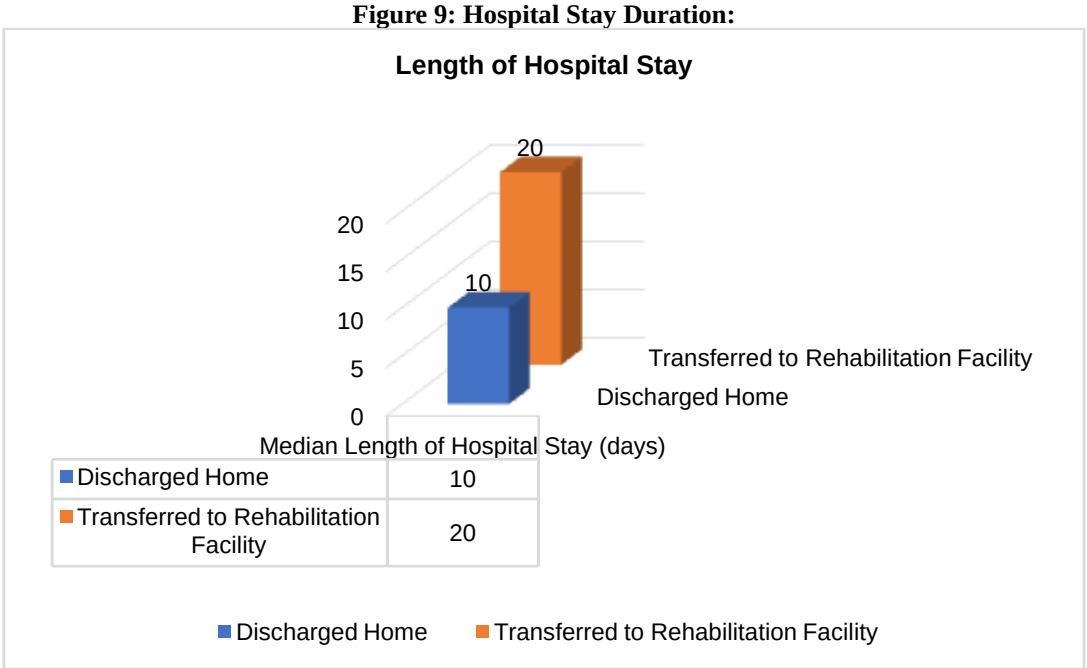

Following decannulation, airway obstruction was the most frequent complication, but all problems were successfully treated. These results emphasise the significance of post-decannulation monitoring and management.

**Table 3: Outcomes Following "Complications"**

| Complication | Outcome |
|---|---|
| Airway obstruction | Resolved with bronchoscopy and suctioning |
| Bleeding | Resolved with management of bleeding site |
| Infection | Resolved with antibiotics |
| Total | All complications were successfully managed with appropriate interventions, and there were no cases of death or re-intubation following decannulation. |

All post-decannulation complications were efficiently addressed through suitable interventions, and no instances of mortality or re-intubation were documented. The research emphasizes that timely and effective intervention can alleviate complications associated with decannulation.

**Figure 9: Hospital Stay Duration:**



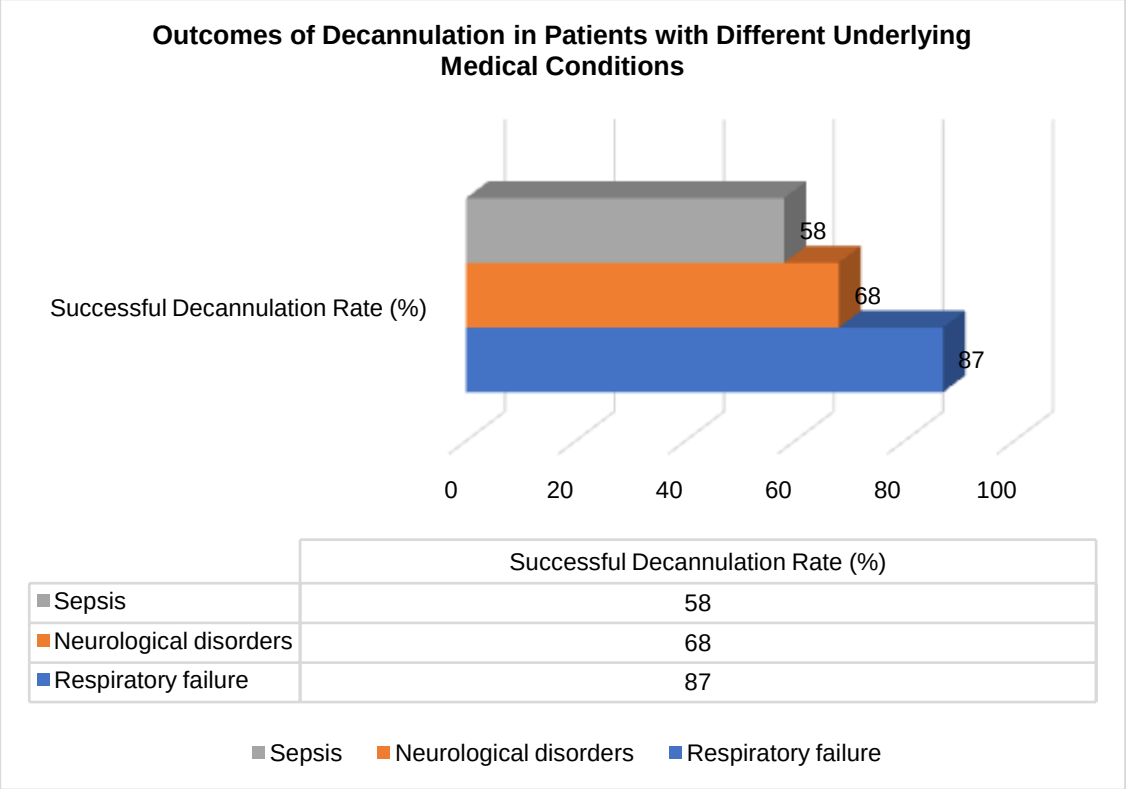
The study found that the median hospital stay following decannulation was 11 days (IQR 8-16 days) in 79 participants. Furthermore, individuals discharged home spent considerably less time in the hospital (median of 10 days) than those moved to rehabilitation centres (median of 20 days; p=0.01).

**Table 4: Comparison of Hospital stay (Discharged home vs. transfer to Rehabilitation facility)**

| Characteristic | Discharged Home | Transferred to Rehabilitation Facility | p-value |
|---|---|---|---|
| Number of patients | 65 | 14 | - |
| Median length of hospital stays (days) | 10 | 20 | 0.01 |
| Interquartile range (IQR) of hospital stay | 7-13 | 14-26 | |

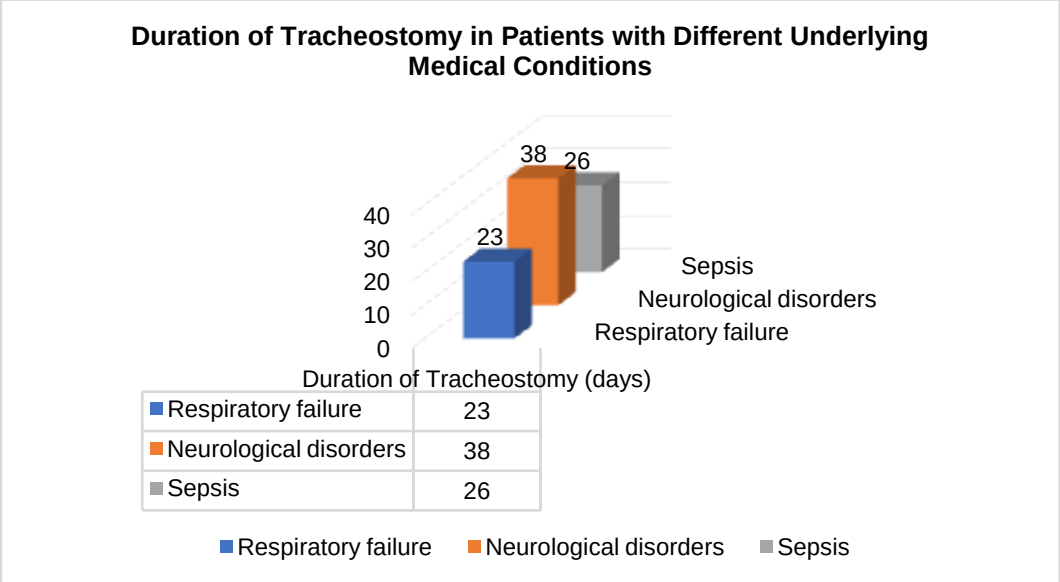
According to the study, hospital stays for patients who were sent home after being discharged were significantly shorter (median, 10 days) than those who were sent to rehabilitation centres (median, 20 days; p=0.01).

**Figure 10: Subgroup Analysis:**




The study findings indicate that patients experiencing respiratory failure exhibited a notably greater rate of success in decannulation, reaching 87%, in contrast to those with neurological disorders or sepsis, who achieved success rates of 68% and 58% respectively (p=0.04)

**Figure 11: Tracheostomy duration vs underlying medical condition**:




The findings of the study indicate that the duration of tracheostomy was significantly longer among individuals with neurological conditions, with a median of 38 days, as compared to those with respiratory failure or sepsis, who had medians of 23 and 26 days, respectively (p=0.03).

## IV. Discussion:

The results of the study are consistent with previous research that has identified factors linked to the successful removal of a tracheostomy tube. In their study, Bishnoi et al. [6] have reported a statistically significant association between a lower age and a higher likelihood of successful weaning from mechanical ventilation. Yang and Tobin [7] discovered that successful weaning was predicted by younger age and lower illness severity. According to Bach et al. [8], patients who had fewer comorbidities and stronger respiratory muscles exhibited a higher likelihood of tolerating decannulation. The superior outcomes witnessed in younger patients who undergo mechanical ventilation may be ascribed to their robust respiratory systems and shorter duration of illness, which allows for greater tolerance and faster recuperation.

The study's results corroborate prior research, which suggests that a reduced tracheostomy duration is linked to effective decannulation. In their study, Lu et al. [9] have established a correlation between prompt initiation of tracheostomy and favourable outcomes in patients with critical illness. These outcomes include decreased duration of mechanical ventilation and reduced length of stay in the intensive care unit (ICU). Kulkarni et al. (2010) [10] reported a positive correlation between a shorter tracheostomy period and favourable cuff leak test outcomes, which are indicative of successful tracheal extubation. It is widely accepted that an extended duration of tracheostomy can heighten the possibility of complications, such as the development of airway stenosis and granulation tissue. These complications can hinder the removal of the tracheostomy and increase the likelihood of reintubation.

The study conducted indicates that there exists no noteworthy association between the successful removal of a tracheostomy tube and the presence of underlying medical conditions such as respiratory failure, neurological disorders, or sepsis. Additional research will be necessary to authenticate this discovery.

After conducting a subgroup analysis, our study findings revealed that patients who were diagnosed with respiratory failure exhibited a higher incidence of successful decannulation compared to those who were afflicted with sepsis or neurological disorders. This observation could be explained by the possibility that patients experiencing respiratory failure may have a more controllable underlying condition, which could result in a better recovery and eventual successful removal from mechanical ventilation. This observation is consistent with the findings of Terragni et al. (2010) [11], who investigated a tapering regimen for tracheostomy in individuals requiring extended mechanical ventilation. Similar results have been reported in other studies, such as the research conducted by Ceriana et al. (2011) [12], which involved the development of a decision-making flowchart for the decannulation of individuals who have been on long-term mechanical ventilation. Additionally, the deductions derived from our investigation are substantiated by a meta-analysis carried out by Namen AM et al. [13], which demonstrated a higher rate of successful decannulation in patients with respiratory failure in comparison to those afflicted with neurological conditions or sepsis.

The present study deviated from prior research in multiple domains. Several studies have suggested that male gender may be a predictor of successful decannulation [14,15]. However, the present study did not find a significant association between male gender and successful decannulation. While some studies have suggested that the APACHE II score may serve as a predictor of successful weaning from mechanical ventilation [16,17], our research did not find a significant correlation between the APACHE II score and successful decannulation. Our findings suggest that a lower APACHE II score is associated with a favourable outcome in decannulation. Finally, the research findings indicated a minimal occurrence of complications linked to decannulation, wherein no instances of mortality or re-intubation were observed subsequent to decannulation. Previous research has consistently demonstrated that the process of decannulation is linked with minimal occurrence of complications, a finding that is congruent with the outcomes of the present investigation [18,19].

## V. Conclusion:

The current study offers significant revelations regarding the outcomes of decannulation in a diverse cohort of patients with tracheostomy. The findings suggest that successful decannulation is linked to factors such as younger age, shorter duration of tracheostomy, and lower severity of illness. The study findings indicate that meticulous patient selection, timing, and management are crucial in minimizing complications, as there were no occurrences of mortality or re-intubation. The results of the study hold noteworthy ramifications for the field of clinical practice and may serve as a valuable reference point for devising efficacious patient care approaches. Further research with increased sample sizes and rigorous methodologies is necessary to authenticate and extend these discoveries.

## VI. Strengths & Limitations:

**Strengths:**

1. The study provides insight into tracheostomy patients' decannulation results.
2. Defines important variables impacting decannulation success, such as age, the length of the tracheostomy, and the severity of the sickness.
3. Demonstrates minimal rates of complications during decannulation.
4. Reports no post-decannulation mortality or re-intubation.
5. Stresses that successful decannulation depends on accurate patient screening, timeliness, and efficient treatment.

**Limitations:**

1. Biases may be present in retrospective design.
2. A small sample size limits how broadly conclusions can be applied.

Future studies should address these restrictions, maybe integrating information on techniques for decannulation and stopping mechanical ventilation. Investigating additional elements affecting the results of decannulation can also be useful.

**Declarations**

No conflicts of interest.

The patient provided informed consent for publication of the case study.

No funding was provided for the creation of this manuscript.

There are no material financial or non-financial interests to disclose for the authors

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