

## Tracheostomy care and outcomes in a tertiary care hospital in Sikkim- An observational study

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**Abstract:** *Background:* Tracheostomy is life saving in patients with neurological deficits, coma or facial trauma as it provides access for clearing the retained secretions and facilitates prolonged mechanical ventilation (MV). Patients with catastrophic neurologic insults, severe trauma or secondary respiratory failure had difficulty in weaning off a ventilator as well as delayed decanulation. *Aim of the Study:* To study the incidence and types of complications of Tracheostomy in a tertiary care Hospital setup in Sikkim with an objective to analyze the impact of socio-demographic profile of patient and co-morbidities on the successful decannulation in a tracheostomized patient. *Materials:* 51 patients on Mechanical Ventilation, requiring Tracheostomy for different indications at CRH, SMIMS, Tadong, Gangtok, Sikkim were analyzed. Demographic data and clinical finding were analysed. The effect of co-morbidities, duration of mechanical ventilation on the complications, and successful decanulation and the final outcomes were analyzed. *Results:* Among the 51 patients 49.01% were aged between 51 and 70 years. 70.58% were males and 129.41% were females with a male to female ratio of 2.4:1. Emergency Tracheostomy was done in 19.60% and on Elective basis in 80.39%. The correlation between length of the ICU stay and early & late Tracheostomy performed was significant ( $r=0.613$ ,  $p=0.000$ ). Association between co-morbidities and delayed decannulation was not significant ( $p=0.167$ ). *Conclusions:* Tracheostomy on patients with prolonged mechanical ventilation was more commonly elective. The commonest indication for prolonged mechanical ventilation was trauma & intracranial tumours. The most common complications encountered were intra-operative haemorrhage, early postoperative complication was subcutaneous emphysema & late complication was stomal granulation tissue.

**Keywords:** Tracheostomy, Decanulation, Tracheo-esophageal fistula, Tracheomalacia, Mechanical Ventilation.

### Introduction

Tracheostomy is a procedure undertaken since ancient times [1]. Complications vary from being granulation tissue to fatality [2]. They are Intra-operative: Haemorrhage, injury to Para tracheal structures, trachea, larynx, apnoea, air embolism, airway fire & cardiac arrest [2]. Subcutaneous emphysema, tube blockage or displacement, wound infection, Pneumothorax, secondary haemorrhage, tracheal necrosis and swallowing occur as early complications [3].

*The late ones are:* Tracheo-esophageal fistulae, trachea-cutaneous fistulae, granulomas formation, laryngo-tracheal stenosis, Tracheostomy scar,

difficult decanulation) [3-6]. When the primary condition of patient improves Decanulation is undertaken.

*Factors that decide decanulation are:* non-dependency on ventilator, well alert, oriented and responsive patient without risk of aspiration [7]. Such patients should be able to maintain spontaneous respiration by perfect coordination of brain, swallowing, cough reflex and phonation. Central Referral Hospital (CRH) is a tertiary care referral hospital of Sikkim where all the cases of head injury in state and most critically ill patients like CVA, meningitis, Organophosphate poisoning, Parkinsonism, Motor Neuron

Disease, encephalitis, seizure disorder are referred here and managed. The study intends to formulate a standard protocol for Tracheostomy care in this hospital setup that will aim to improve the outcome (successful decannulation). Since there was no previous study done in Sikkim, the present hospital-based prospective observational study was done at our tertiary care centre so as to assess the relationship of co morbidities with decannulation and to know complication rates.

## Material and Methods

*Study Design:* Hospital based (observational) prospective study.

*Study Setting:* This study will be conducted at CRH, SMIMS, Tadong, Hospital, Gangtok.

*Study Duration:* The study will be conducted over duration of 2 yrs. (18 months for data collection, 6 months for data analysis).

*Source of Data:* All patients admitted in CRH with Tracheostomy or requiring Tracheostomy.

*Collection of Data:* All patients with Tracheostomy / requiring Tracheostomy will be observed and assessed for the procedure, the Tracheostomy care.

*Inclusion Criteria:* All patients in CRH with Tracheostomy or requiring Tracheostomy. Age>18yrs.

*Exclusion Criteria:* Patients aged below 18 were not included. Patients unwilling to participate in the study were excluded. Percutaneous Tracheostomy procedures undertaken were excluded.

*Methodology:* Institute Ethics committee has given approval for this study. Consent for the study was obtained from all the patients or legal guardians prior to the procedure. The indications were documented along with history (signs & symptoms, past treatment history) including socio-demographic variables and ENT examination findings. All patients who underwent elective Tracheostomy, haematological investigations like CBC, LFT, KFT and bleeding and clotting time were done preoperatively. X-ray Chest PA view and lateral views taken. X-ray Soft tissue neck; AP and lateral views were taken.

Computed Tomography scan of Neck and thorax were done preoperatively wherever required. The procedure was carried out in the regular operation theatre with all aseptic precautions in a well-equipped operating room with a good suction and electrocautery. Mid-line or transverse creases were used based on the type of Tracheostomy. A mid Tracheostomy was performed in most of the cases, the stoma being made in between second & third tracheal rings. Standard Portex (Smiths medical) cuffed Tracheostomy tubes (size 7.0 mm to 8.0 mm inner diameter) were used in all patients.

The complications that occurred during and after the Tracheostomies were documented. All were given intensive care during the first 48 hours postoperatively with strict attention paid for frequent suctioning of the tube, continuous oxygen saturation monitoring and periodic deflation of the cuff. A chest X-ray was taken for all patients postoperatively after 24 hours. Complications like haemorrhage, surgical emphysema and tube displacement/blockage etc were carefully monitored and managed on an emergency basis. Complications were labelled as immediate when occurred within first 24 hours, as early after 24 hours up to 14 days and later on as late if occurred after 14 days.

*Care of Tracheostomy Tube Ties & Cuff:* Ties should be 2 fingers loose (improvement in nursing). Only one fingertip should be admitted between the tape & patient's neck. Deflation and re-inflation of cuff was done for 10 minutes at regular 2 hourly in the 1<sup>st</sup> 24 hours. It was done for 10 minutes, 4<sup>th</sup> hourly for the next 5 days and 6<sup>th</sup> hourly thereafter. Cuff pressure measured subjectively by digital palpation of the cuff and hand-cuff manometer. Approximately 15-20 mm Hg pressure was used for cuff inflation.

*Humidification:* Humidification is usually done by cold water humidifier in ICU on ventilator, or till the patient is dependent on oxygen. Once the patient is weaned off from ventilator & ambulatory, we used wet saline gauge or Heat & Moist Exchanger over the tubal opening.

**Tracheostomy Suction:** Before the start of Tracheostomy tube cleaning, suctioning of secretion from oral cavity was done thoroughly. Suctioning was performed initially every 3 hours and then whenever necessary. Abnormal breath sounds were the indication requiring clearing of secretions. Similarly drop in saturation, Irregular respiratory pattern. Increase in coughing. Clammy cyanosed skin colour changes are also to be watched.

**Steps of TT Suction:** Pre-oxygenation is considered if the patient has a clinically important reduction in oxygen saturation with suctioning. Patients on ventilator support were subjected to suctioning without disconnecting the ventilator.

### Results

A prospective study was conducted at CRH Hospital, Gangtok Sikkim for a period of 16 months. 51 patients admitted with an indication for Tracheostomy were analysed for the complications. Patients aged above 18 years were included. The Age and Gender distribution of the patients was tabled in the Table 1. There were 36/51 (70.58%) males and 15/51 (29.41%) females with a male to female ratio of 2.4:1. 49.01% of the total patients belonged to the age groups between 51 and 70 years (Table1). The most common age group was between 50 and 60 years (25.4%), followed by 60 to 70 years age group (23.5 %) and followed by 30 to 40 years age group (17.6%) (Table 1). The least common age group was 20 to 30 years and & 70 to 80 years (09.8 %). There was no statistical significant correlation between age and gender and the incidence of Tracheostomies (p value more than 0.05).

Table-1: Showing the Age and Gender distribution in the study (n-51)			
Age Distribution	Number	Percentage	P value
20-30 years	05	09.80	0.134
31-40 years	09	17.64	
41-50 years	07	13.72	
51-60 years	13	25.49	
61-70 years	12	23.52	
71-80 years	05	09.80	
Gender Distribution			
Male	36	70.58	0.112
Female	15	29.41	--

**Body Mass Index:** The BMI was below 29Kg/m<sup>2</sup> in 37/52 (72.54%) of the patients and above 29 Kg m<sup>2</sup> in 14/51 (27.45%) patients which was significant statistically with p value at 0.001(p significant at less than 0.05) (Table 2).

Table-2: Showing the BMI of the subjects in the study (n-51)			
Observation	Number	Percentage	P value
<u>BMI mean values</u>			
Less than 29Kg/m <sup>2</sup>	37	72.54	0.001
More than 29Kg/m <sup>2</sup>	14	27.45	

There were 27/51 (52.94%) patients with different co-morbidities observed in this study. Diabetes was observed in 11/51 (21.56%) patients, Hypertension in 08/51 (15.68%) patients, Chronic Kidney Disease in 04/51 (07.84%) and Hypothyroidism in 02/51 (03.92%) and Malnutrition in 02/51 (03.92%) patients (Table 3).

Table-3: Showing the co-morbidities in the study (n-51)			
Co-morbidities	Number	% age	P value
Diabetes Mellitus	11	21.56	0.814
Hypertension	08	15.68	
CKD	04	07.84	
Hypothyroidism	02	03.92	
Malnutrition	02	03.92	

**Timing of Tracheostomy:** The present study showed emergency Tracheostomy being performed in 10/51 (19.60%) of the patients whereas the remaining were undertaken on Elective basis; 41/51 (80.39%) (Table 4).

Table-4: Showing the type of Tracheostomy (n-51)			
Type of Tracheostomy	Number	% age	P value
Elective	41	80.39	0.001
Emergency	10	19.60	

40/51 (78.43%) patients underwent Emergency Tracheostomy and 11/51 (21.56%) patients underwent Elective Tracheostomy in the study. Among the Emergency Tracheostomy cases the

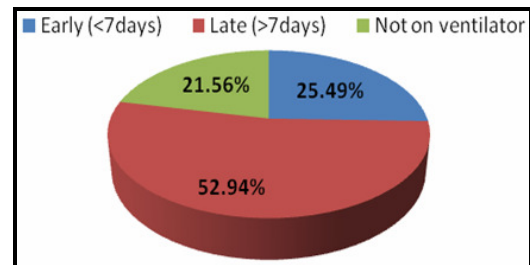
indications were Cerebro-vascular accidents in 13/51 (25.49%), Acute Respiratory Distress (malignancies of larynx, hypo-pharynx, thyroid, neck space infections and severe neck injuries) in 08/51 (15.68%) patients, Severe Pneumonia in 07/51 (13.72%) patients, Severe Burns in 05/51 (09.80%) patients, Spinal Injuries in 03/51 (05.88%) and Neck trauma- cut throat injuries in 04/51 (07.84%) patients. Among the Elective Tracheostomy procedures, CVA was the indication in 08/51 (15.68%) patients, Brain tumors in 02/51 (05.88%) and in 01/51 (01.96%) patient the indication was Coma due to poisoning. (Table 5) There was no statistical significance in the incidence of different indications noted in the study (p value was >0.05)

<b>Table-5: Showing the indications for emergency and elective Tracheostomies in the study (n-51)</b>			
<b>Indications of Tracheostomy</b>	<b>Number</b>	<b>% age</b>	<b>P value</b>
<u>Emergency Tracheostomy</u>	<u>40</u>	<u>78.43</u>	0.116
CVA	13	25.49	
Acute Respiratory Distress	08	15.68	
Severe Pneumonia	07	13.72	
Severe Burns	05	09.80	
Spinal Injuries	03	05.88	
Neck Trauma- Cut throat)	04	07.84	
<u>Elective Tracheostomy</u>	<u>11</u>	<u>21.56</u>	0.761
CVA	08	15.68	
Brain Tumours	02	03.92	
Coma due to poisoning	01	01.96	
Total	51	100	--

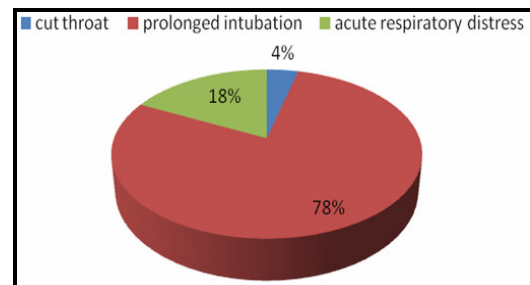
**Number of Days on Mechanical Ventilation:** The number of patients who underwent Tracheostomy after mechanical ventilation was 40 (78.43%). Patients who underwent Tracheostomy within 07 days of ventilation were 13 (25.49%) and more than 07 days was 40 (78.43%). 11/51 (21.56%) patients were not mechanically ventilated before Tracheostomy. There was statistical significance (r-0.613, p-0.000) in correlation between length of the ICU stay and early & late Tracheostomy performed as calculated by spearman's rank correlation coefficient. Early or late Tracheostomy had no association with development of complications, Decannulation or

mortality in our study; this may arise due to smaller sample size (Fig 1a and 1 b).

**Fig-1(a):** Showing the number of days the patients were on the ventilator and undergone Tracheostomy 07 days prior and after mechanical ventilation and those who were not ventilated (n-51).

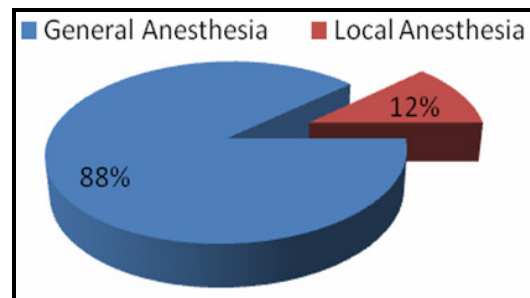


**Fig-1(b):** Showing the patients undergone Tracheostomy for acute respiratory distress and patients on prolonged intubation (n-51).



General anaesthesia was used in 45/51 (88.2%) patients and in the remaining 06 (11.7%) patients local infiltration anaesthesia was used for Tracheostomy in the study (Fig 2).

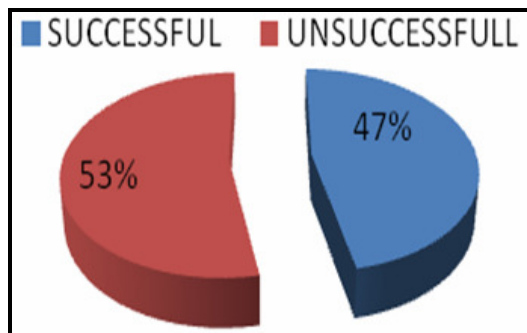
**Fig-2:** Showing the type of anaesthesia given to perform Tracheostomy n-(51)



In 34/51 (66.66%) patient's horizontal incision was used for Tracheostomy and in the remaining 17 (33.3%) patients vertical incision was used. Among the Emergency Tracheostomy group of 40 patients, in patients 10/40 (25%) vertical incision was used. The

remaining 30/40 (75%) patient's horizontal incision was used (Fig 3).

**Fig-3:** Chart showing the type of incision used for Tracheostomy (n=51)



**Complications:** 41/51 (80.39%) of the Tracheostomy patients developed complications. The complications were:

**Immediate Complications** (within 24 hours post-operative period) - **07** (13.7%) patients developed and among them Primary haemorrhage occurred in 05 (9.80%) and Apnoea in 02 (3.92%). Complications such as airway fire, cardiac arrest, air embolism, injury to Para-tracheal structures, trauma to trachea & larynx were not noted in the present study.

**Early complications** (1-14 days after ST) - 18 (35.29%) patients developed them: Surgical Emphysema in 10 (19.60%) patients Out of these 10 patients, 04/51 had undergone Tracheostomy for malignancy of larynx and Hypo-pharynx. Surgical Emphysema was not fatal in this study. Out of these 04 patients, 01 (one) was diagnosed with carcinoma pyriform-fossa, 01 (one) with Carcinoma hypo-pharynx, one (01) with Carcinoma lung with neck metastasis and one (01) with Carcinoma larynx (sub-glottis) region).

04/51 (%) patients of suicidal cut throat injury had also developed surgical emphysema in early postoperative period. Out of these 04 patients in 02 (50%) patients surgical emphysema extended into the neck and chest, but subsided over a period of 7 days after conservative management. In another patient who had an enlarged thyroid nodule in the isthmus the elective Tracheostomy was difficult to identify the trachea. The patient had minimal surgical emphysema in the neck which subsided over 3 days. 01 (One) patient diagnosed as a case of bilateral abductor palsy

also developed surgical emphysema in early postoperative period.

**Tubal obstruction:** It was noted in 04 (7.84%) patients. This complication was the 4<sup>th</sup> most common complication in this study. Out of 04, three (03) developed thick mucus plugs and in 01 patient obstruction was due to blood clots obstructing the lumen completely and patient went into asphyxia.

**Self Extrusion of Tracheostomy Tube:** This complication was observed in 03 (5.88%) patients. Among the 02 were uncooperative patients who pulled out the tube at home and were brought to emergency. One patient was morbidly obese (the distance from the skin to the trachea), the patient had severe bouts of coughing followed by which the tube was displaced.

**False passage:** It was observed in 01 (1.96%) patient. This patient was diagnosed as carcinoma hypo-pharynx. The trachea was not in the midline and post-surgery he had developed cyanosis with fall in SpO<sub>2</sub> level. The patient was immediately shifted to emergency OT and tube was removed and reinserted under adequate light after identifying the previously made stoma. Other immediate complications like pneumo-thorax, pneumo-mediastinum, Tracheal necrosis, Secondary haemorrhage were not noted in this study.

**Late complications** (>14 days after surgery): they were observed in 16 (31.37%) of patients.

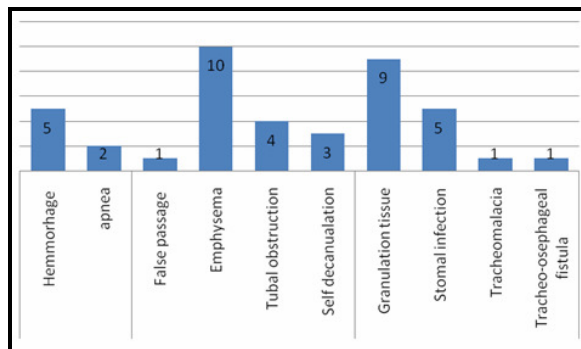
**Granulation tissue around the stoma site:** This was noted in 09/51 (17.64%). This complication was the second most common complication.

**Wound Infections:** They were observed in 05/51 (9.80%) patients. They were the third most common complication seen in this study. 04/05 of them developed wound infection after the discharge at home which was likely due to poor hygiene. These patients were treated with antibiotics and proper wound care with regular Povidone iodine dressings.

**Tracheomalacia:** It was observed in 01/51 (01.96%) patients. This particular patient was referred from another Hospital with Head injury and he was on prolonged endotracheal intubation for more than 10 weeks.

**Tracheo-Esophageal Fistula:** It was observed in 01/51 (01.96%) patient. In the patient the indication was CVA, on Mechanical Ventilation for 02 weeks and was on Ryles tube feeding. One week later this patient developed spilling of copious secretions along with gastric contents through the Tracheostoma especially after the RT feeding. Other late complications such as Tracheo-cutaneous fistula, laryngo-tracheal stenosis, difficult decannulation, Tracheostomy scar were not noted in this study (Fig 4).

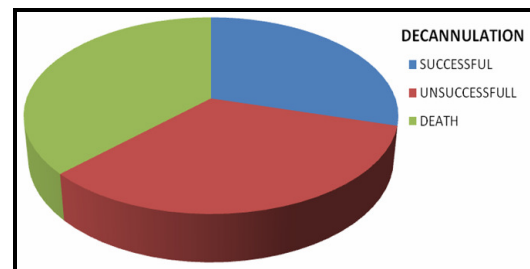
**Fig-4:** Chart showing the complications of Tracheostomy (n-51)



**Decannulation:** Regular assessment of the following criteria was done to assess the fitness of the patients for Decanulation: 1. Glasgow Coma scale: 8. 2. Tracheal secretions whether they were normal (absent/ thin scanty secretions) or abnormal (thick, tenacious secretions) was observed. 3. Patient's ability to cough out and manage tracheal secretions was observed. 4. Patient's ability to swallow without aspiration was noted.

Successful Decannulation was undertaken in 15/51 (29.41%) patients who fulfilled all the above Criteria. Partial occlusion was done for initial 24 to 48 hours followed by complete occlusion for another 24 hours. 17/51 (33.33%) patients did not fulfil the criteria for decannulation, were on the tube as their primary condition was not improving and were still on follow-up when this study concluded. 19/51 (37.25%) patients died during the hospital stay or follow-up period before decannulation (Fig 5).

**Fig-5:** Showing the Final outcomes of Tracheostomy in the study (n-51)



Analysis of relationship of co-morbidities with the successful decannulation was done and found that there was no significant association between co-morbidities and decannulation.  $X^2(1) = 1.905$ ,  $p = 0.167$ . Additionally, there was no association seen between decannulation and the frequency of tube change and ventilator use in our study. [ $\chi^2 = 2.943$ ,  $df = 1$ ,  $p = 0.086$ ]

## Discussion

This prospective, observational study was undertaken document outcomes of Tracheostomy care in a tertiary care hospital at CRH in Sikkim. The time period of study was from October 2018 to October 2020. Tracheostomy is a common surgical procedure that is lifesaving, however, is not without complications. Many of these complications can be prevented by good post-operative care.

The most important outcome of Tracheostomy is decannulation which can be done when the patient meets the set criteria for it. Among the 51 patients the age range was 20-80 years, with a mean age of 51.30 years. The most common age group was 50 to 60 years with 13 cases (25.4 %), followed by 60 to 70 years age with 12 patients (23.5 %), and followed by 30 to 40 years group with 09 cases (17.6%). Rashid MHO et al [8] who reported highest incidence in the age group of 51 to 60 years with mean age of 53.60 years. Talukdar et al [9] reported 30.9% patients in the age group of 40 to 50 years.

**Gender:** The present study showed male predilection (M: F:: 2.4:1). 70.6% were males and 29.4% were females. Rashid MHO et al [8] reported among the 100 cases studied, 86 males and 14 females with M: F: 6.14:1).

Talukdar et al [9] reported 76.36% males and 23.64% females with M: F: 3.2:1).

**BMI:** In our study 14 patients (27.5%) belonged to the overweight category with BMI range between 25.0 and 29.9. Complications in those with high BMI were 04 cases (07.84%) of granulation tissue, 3 cases (05.88%) of surgical emphysema, 2 cases (03.92%) of stomal infection and 01 case (01.96%) each of haemorrhage, false passage, and self decannulation. The complication rate of surgical Tracheostomy in obese patients is estimated at 25%; most complications were minor.

**Indication Of Tracheostomy (Emergency/ Elective:** Elective Tracheostomy was done in 78.4% of the patients who were on the endotracheal tube, and in view of prolonged mechanical ventilation and to fasten weaning off from ventilator especially in head injury patients and CVA cases. A study done by Ashwin et al [10] showed 48% underwent elective Tracheostomy for Cerebro-vascular accidents, organo-phosphorus poisoning, and other neurological conditions). Faizal-i-Wahid et al [11] in an audit of 160 Tracheostomies done in a tertiary care hospital reported 12 cases (7.5%) as elective procedure performed for inoperable tumours and 148 cases (92.5%) as emergency. Ashwin et al [10] showed emergency Tracheostomy was done for 52 patients (52%) who included patients presented with acute upper airway obstruction (malignancies of larynx, hypopharynx, thyroid, neck space infections and severe neck injuries).

Early Surgical Tracheostomy (ST) was done before 07 days in 25.5% of the patients and late Surgical Tracheostomy was done in 52.9% of patients who were on mechanical ventilation and found that early ST group had shown faster improvement in their respiratory condition with reduced ICU stay. There was significant ( $r=0.613$ ,  $p=0.000$ ) relation between duration of ICU stay in early & late Tracheostomy groups as shown by spearman's rank correlation coefficient. Statistically early and late Tracheostomy groups had no association with development of complications, decannulation or mortality in this study. Griffiths et al [12] reported a significant decrease in the duration of ICU stay in early Tracheostomy cases. Shan L et al [13] had similar

view in cases of early (3-7 days) ST cases. Ridley RW [14] studied on critically ill patients, reported that early Tracheostomy had decreased ICU stay compared to late ST cases.

**Mortality:** 19 patients (37.2%) died during the hospital stay or follow-up period before decannulation. Boudierka et al [15] on severe head injury patients with early (5<sup>th</sup> day) and late ST reported no difference in mortality. Young D, Harrison DA [16] from UK assessed the impact of early versus late (day 10 or later) Tracheostomy and reported no significant difference in mortality. Young et al [16], Wang et al [17] and Griffiths et al [20] reported no beneficial effect on overall mortality in patients with early Tracheostomy. It was observed in this study that there was no association between early Tracheostomy and decrease in incidence of pneumonia as a complication. Ridley RW [14] reported similar views from his study. Wang et al. [17] also reported no difference in rate of lung complications in early and late Tracheostomy group. In this study 09.8% patients had primary haemorrhage. Rashid MHO et al [8] reported 07%, and Ashwin et al. [10] reported 08.8%, Talukdar et al [9] reported 9.1% incidence of primary haemorrhage. Higher incidence was reported in Faizal-i-Wahid et al [11] 16.87%, lower incidence was noted in Goldenberg et al [18]. 04.3%. No incidence of primary haemorrhage was reported by P.V. Santosh et al [19].

Apnoea was seen in 03.9% (2 patients) patients that were due to CO<sub>2</sub> washout (lung metastasis and aspiration of blood in lungs in a case of suicidal cut throat). Similar incidence of 1.8% apnoea was reported by Talukdar et al [9]. No apnoeic episode reported in studies by Faizal-i-Wahid et al. [11], Ashwin et al [10]. Goldenberg et al [18], Surgical emphysema was seen in 19.6% patients in this study. Similar surgical emphysema incidence reported by M.A.R. Bhuiyan [20] in 19%. Lower incidence was noted in a study by Talukdar et al [9] - 3.62%, P.V. Santosh et al [19] - 02 (3.3%) cases. Higher incidence of 32% reported by Ashwin et al [10] Tubal obstruction was noted in 07.8% patients in this study.

Similar incidence also reported by Ashwin et al. [10] – 08.8% and by Talukdar et al [9] - 70.27%. Lower incidence was reported by P.V. Santosh et al [19] - 05.5%, Goldenberg et al [18] - 04.3% and M.A.R. Bhuiyan et al. [20] -03 %. Self decanulation was noted in 05.8% patients. Ashwin et al [10] reported in 05.8% cases. No case of self decanulation reported by Goldenberg et al [18], P.V. Santosh et al. [19], Rashid MHO, Mohamed A. [8]. False passage was observed in 01.9% patients in this study which was a patient with sub-glottic carcinoma. M.A.R. Bhuiyan et al. [20] reported that patients with Head and neck malignancy showed higher rate of tube displacement & false passage with 03% in his study. Granulation tissue around tracheal stoma site was noted in 17.6% patients as a late complication. This was the second most common complications in this study. Lower incidence of 08.3% stomal granulation has been reported by P.V. Santosh et al [19].

Similarly 08.8% incidence was reported by Ashwin et al [10] No granulation tissue complication was reported by Goldenberg et al. [20], Rashid MHO, et al. [8]. In this study 09.8% patients developed stomal infection. Higher incidence was noted in a study performed by Ashwin et al [10] 29.4% & lower incidence was reported by Rashid MHO, et al [8] -04% and 05% cases noted by P.V. Santosh et al [19]. In one patient (01.9%) trachea-malacia was noted in whom decanulation failed. He was on endo-tracheal tube support for more than 10 weeks and few attempts of extubation failed, hence Tracheostomy was undertaken. The diagnosis was confirmed on Bronchoscopy examination involving approximately three rings of trachea. Hegde et al [21] reported similar occurrence.

Tracheo-esophageal fistula (TEF) was noted in one patient (01.9%) in this study two weeks after Tracheostomy. This patient was found to have CVA and developed copious secretions and particles coming out from the stomal site after Ryle's tube feeding, more so in lying position. The patient passed away 4 weeks after the Tracheostomy. Ashwin et al [10] reported TEF in 02.9% cases. No TEF complication reported by Goldenberg et al [18] and Rashid MHO [8] Decanulation was achieved successfully in 15 cases (29.4%) and 19 cases (33.3%) succumbed

secondary to their underlying primary condition while 17 cases (37.2%) were still on Tracheostomy tube at the end of our study period.

In this study it was found that there was no significant association between co-morbidities (Diabetes Mellitus, Hypertension, coronary artery disease, Parkinsonism, Depression, Schizophrenia, and Tuberculosis) and successful decannulation. Ceriana P et al [22] in a study population of 72 Tracheostomy patients, 78% of them were successfully decannulated. "They assessed the patient's ability to remove secretions, swallowing function, absence of psychiatric disease, possibility of reaching spontaneous breathing". Another study done on 74 patients of acquired brain injury by Chandrika A et al [23] showed that 77% cases were successfully decannulated. The criteria for decannulation they used were tolerating TT capping for 72 hours & absence of severe dysphagia.

## Conclusion

Tracheostomy on patients with prolonged mechanical ventilation was more commonly elective. Patients in Fifth to sixth decades were commonly affected with male preponderance. General anaesthesia and horizontal incision was common with Elective Tracheostomy, whereas local anaesthesia using vertical incision was common in Emergency types. The most common complications encountered were intra-operative haemorrhage, early postoperative complication was subcutaneous emphysema & late complication was stomal granulation tissue. There were no deaths related to Tracheostomy. Complication rates associated with Tracheostomy could be prevented by thorough anatomical knowledge of trachea & adjacent structures, skill of surgeon, sterile & meticulous surgical technique and meticulous postoperative care which should be followed as per protocol.

*Limitations of the study:* Small sample size, shorter duration of study conducted in a single tertiary care hospital based study. The Long term sequelae were not studied.

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**Conflicts of interest:** There are no conflicts of interest.

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