

# A Comparative Study on Elective and Emergency Tracheostomies in a Tertiary Hospital of Andhra Pradesh

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## Abstract

**Introduction:** Tracheostomy (TR) is a lifesaving procedure, routinely performed in upper airway obstruction and in intensive care unit (ICU) where there is need for prolonged mechanical ventilation (MV). The mortality rates in TR are between 0.5% and 3%. Complication rates quoted in the literature range between 4% and 31% for percutaneous TR and between 6 and 66% for surgical TR. In our country percutaneous endoscopically guided TR is not yet routinely practiced, conventional TR is practiced in the vast majority of cases to manage airway problems.

**Aim of the Study:** The aim of the study was to study the changing trends in indications of elective and emergency tracheostomies and compare the rate and pattern of their complications.

**Materials and Methods:** The study was conducted in ICUs and Department of Otolaryngology-Head and Neck Surgery of Government General Hospital, Kurnool. 100 cases of tracheostomies from November 2012 to October 2014 were included in this study. Both indications of TR; elective and emergency types were included in this study. Selected patients were subjected to investigations preoperatively and postoperatively: X-ray soft tissue neck lateral view, X-ray chest PA view, routine blood, and urine examination, indirect laryngoscopy, video laryngoscopy, DL scopy and biopsy, and CT scans neck with contrast were done. The indications for emergency and elective tracheostomies were noted and compared with other studies. Complications encountered were also compared with other studies.

**Observations and Results:** Overall, data of 100 patients undergoing TR were collected. The most common indication of elective TR was head injury with prolonged MV in 27 cases, OP poisoning in 20 cases, and GB syndrome in 2 cases. The most common indications of emergency TR were SV poisoning in 18 cases, malignancies in 18 cases other indications including diphtheritic tonsillitis, cut throat, hanging, tracheal stenosis, post-RT, and juvenile laryngeal papillomatosis. Out of 100 tracheostomies performed, 20 complications were encountered. The most common complication was tubal blockage in 5 cases, tubal granulation in 3 cases, infection in 3 cases, surgical emphysema in 3 cases, bleeding in 2 cases, tracheal stenosis in 3 cases, and difficulty in decannulation in 1 case. In our study, 51 tracheostomies were performed as an emergency, of which 15 complications were encountered. 49 cases were performed electively of which only 5 complications were encountered.

**Conclusions:** TR is a life surgical procedure that is not devoid of complications; however, most of the complications can be avoided with meticulous technique, adequate, and appropriate post-operative care.

**Key words:** Complications of tracheostomy, Elective tracheostomy, Emergency tracheostomy, intensive care units, Tracheostomy

## INTRODUCTION

Tracheostomy (TR) was first mentioned by Galen and Arejeus first in 2<sup>nd</sup> centuries A.D. The development of TR has been

divided into five periods: The period of legend dating from 2000 B.C. to A.D. 1546; the period of fear from 1546 to 1833 during which the operation was performed only by a brave few, often at the risk of their reputations; the period of drama from 1833 to 1932 during which the procedure was generally performed only in emergency situation on acutely obstructed patient; the period of enthusiasm from 1932 to 1965 during which the adage, if you think TR do it became popular; and the period of rationalization from 1965 to the present.<sup>[1]</sup> In 1620, Habicot performed the first pediatric tracheotomy.<sup>[2,3]</sup> In the early 1900s, Chevalier Jackson standardized the procedure and demonstrated that

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the mortality rate was significantly reduced if the procedure was performed properly and careful attention was paid to post-operative care.<sup>[4-6]</sup> In 1909, a lower TR technique was introduced in which the tracheal incision extends to the 4<sup>th</sup> or 5<sup>th</sup> tracheal ring. This operative technique was refined and further standardized by Chevalier Jackson who advocated a low tracheotomy in second and third tracheal rings as opposed to a high tracheotomy (cricothyrotomy).<sup>[7,8]</sup>

### Institute of Study

This study was conducted at the Department of Otolaryngology - Head and Neck Surgery and intensive care unit (ICUs) of Government General Hospital, Kurnool.

### Type of Study

This was a cross-sectional analytical study.

### Period of Study

This study was from November 2012 to October 2014.

## MATERIALS AND METHODS

The study was conducted in the ICUs and Department of Otolaryngology - Head and Neck Surgery of Government General Hospital, Kurnool. 100 cases of tracheostomies from November 2012 to October 2014 were included in this study. Both indications of TR; elective and emergency types were included in this study. Selected patients were subjected to investigations preoperatively and postoperatively: X-ray soft tissue neck lateral view, X-ray chest PA view, routine blood, and urine examination, indirect laryngoscopy, video laryngoscopy, DL scopy, and biopsy and CT scans neck with contrast were done. An Ethical Committee Clearance was obtained from the institute. An Ethical Committee cleared consent form was used for the study.

### Inclusion Criteria

1. Patients of all age groups are included.
2. Patients presenting with stridor were included.
3. Patients on endotracheal intubation in acute medical and surgical care units are included.
4. Patients with stridor due to upper airway malignant diseases were included.

### Exclusion Criteria

1. Patients with cardio respiratory and systemic disorders were excluded.
2. Patients who have undergone tracheostomies at other hospitals were excluded.

All the patients were performed with standard surgical TR procedure at bedside in ICU or emergency operation theater depending on the indication and situation. All the selected patients who underwent standard TR procedure

were given intensive care for the first 48 h postoperatively. A cuffed Portex TR tube was used in all cases, later the tube changed to Jackson's metal TR tube. Problems encountered during surgery were documented in the operative notes. The immediate post-operative problems were seen in post-operative ward. Intermediate post-operative complications were assessed when patients were shifted to the ward after 48 h. Late post-operative complications were assessed during the follow-up of the patient after the discharge. In the post-operative ward, TR care was given by the surgeon and the attending nurse, while the patient's caregiver was asked to observe the same. In the ward, TR care was given whenever the tracheostoma was blocked with sputum or secretions. The patient's care giver was taught the method of giving tracheostoma care during the stay in the hospital. At the time of discharge, the patient was sent with Jackson's metal TR tube. Regular follow-up of the patients was done as follows: Twice a week for 1<sup>st</sup> month; once a week for 2<sup>nd</sup> month. Monthly twice in the 3<sup>rd</sup> month and finally whenever patient has any problems, he/she was asked to come for follow-up. During follow-up in Minor OT, inspection of the TR tube, cleaning, and dressing was done. The advice was given as required. When the TR was no longer required, the tube was occluded for 24 h to confirm the adequacy of the laryngeal airway. The tube was then removed, and an airtight dressing applied. All the data collected were analyzed using standard statistical methods.

## OBSERVATIONS AND RESULTS

Overall, data of 100 patients undergoing TR were collected. The most common indication of elective TR was head injury with prolonged mechanical ventilation (MV) in 27 cases, OP poisoning in 20 cases, and GB syndrome in 2 cases. The most common indications of emergency TR were SV poisoning in 18 cases, malignancies in 18 cases other indications including diphtheritic tonsillitis, cutthroat, hanging, tracheal stenosis, post-RT, and juvenile laryngeal papillomatosis (JLP). Out of 100 tracheostomies performed, 20 complications were encountered. The most common complication was tubal blockade in 5 cases, tubal granulation in 3 cases, infection in 3 cases, surgical emphysema in 3 cases, bleeding in 2 cases, tracheal stenosis in 3 cases, and difficulty in decannulation in 1 case. In our study, 51 tracheostomies were performed as an emergency, of which 15 complications were encountered. 49 cases were performed electively of which only 5 complications were encountered. The complications in these two groups were compared with the Chi-square test which was statistically significant. Out of 100 cases, 48 cases were decannulated, 37 cases died, 12 cases were on follow-up, and 3 cases were referred to higher centers. Overall mortality was 37%. Mortality due to complications of TR was 0%. Out of

18 cases of SV Poisoning, 1 case died due to renal failure and remaining 17 cases were decannulated. 56 patients out of 100 were in the age group of 20–40 years. The age incidence according to age groups was tabulated in Table 1.

In the present study out of 100 cases, 65 are male patients and 35 are female patients with a male to female ratio of 1:1.85. Among the 65 males, 27 were performed emergency TR, and among the 35 females 24 underwent emergency and 11 underwent elective TR [Table 2].

Out of 100 patients, 51 underwent emergency TR and 49 underwent elective TR [Table 3].

Out of 100 cases, 27 tracheostomies were performed in head injury patients, 20 tracheostomies were done in (organophosphorous [OP] poisoning) OP poisoning

**Table 1: Age distribution in TR**

Age	Number of cases
0–20	15
21–40	56
41–60	25
61–80	4

TR: Tracheostomy

**Table 2: Sex distribution in TR**

Tracheostomy	Male	Female	Total
Emergency	27	24	51
Elective	38	11	49

TR: Tracheostomy

**Table 3: Type of TR**

Type of tracheostomy	Number of cases
Emergency	51
Elective	49

TR: Tracheostomy

**Table 4: Number of cases in relation to indications (n=100)**

Indications	Number of cases
Head injury	27
OP poisoning	20
GB syndrome	2
SV poisoning	18
Ca. larynx	14
Ca. hypopharynx	4
Diphtheritic tonsillitis	2
Cutthroat	3
Hanging	3
Tracheal stenosis	3
Post RT	2
Juvenile laryngeal papillomatosis	2

SV: Supervasol, Ca: Carcinoma

patients. 18 tracheostomies were done in SV poisoning patients, 14 tracheostomies in carcinoma larynx patients [Table 4 and Figure 1].

Among the head injury patients, 15 patients belonged to the age group of 31–40 years age group [Table 5].

Among the head injury patients, 24/27 were males and 3/27 were females [Table 6]. Males were more commonly involved in road traffic accidents than females.

Super Vasmol (SV) which is a hair dye is one of the common agents used for committing suicide, especially in younger age group people. In this study, 9/18 (50%) of the patients were in the age group of 21–30 years [Table 7].

Among the SV poisoning patients’ females, 16/18 were more common than males 2/18 [Table 8].

Out of 18 cases of SV poisoning, 1 case died due to renal failure, remaining 17 cases (94.44%) were successfully treated and decannulated [Table 9].

The complication rate among the emergency and elective tracheostomies was compared and found that the

**Table 5: Age distribution in head injury**

Age	Number of cases
0–10	1
11–20	0
21–30	6
31–40	15
41–50	5
51–60	0

**Table 6: Sex distribution in head injury**

Number of cases	Male	Female
27	24	3

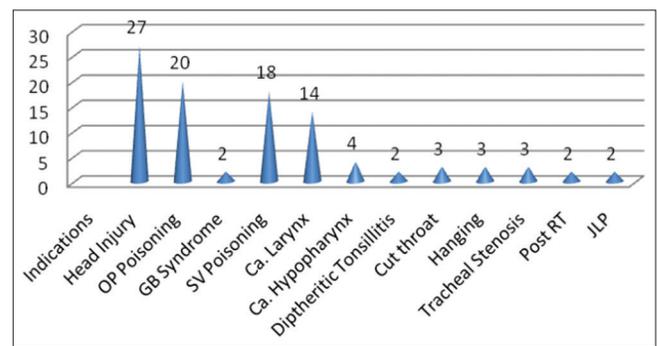


Figure 1: The indications of tracheostomies (n=100) (JLP: Juvenile Laryngeal Papillomatosis)

complications were more common among emergency tracheostomies than elective ones. The comparative results were statistically significant with *P* value at 0.008 (*P* taken significant at <0.05) [Table 10].

The different type of complications encountered in this study in both types of tracheostomies was tabulated in Table 11.

Among the staging of complications in this study, it was found that intermediate complications were more common 11/52 (21.15%) followed by late complications 7/52 (13.46%) [Table 12].

**DISCUSSION**

The present study was conducted including the patients who underwent tracheostomies by the faculty of the Department of ENT in ICUs and Department of Otolaryngology - Head and Neck Surgery of Government General Hospital, Kurnool. 100 cases of tracheostomies from November 2012 to October 2014 were included in this study.

**Age Distribution**

In this study, the youngest to undergo TR was 3 years old, and the oldest was 75 years. Maximum cases performed

between age group of 20–40 years (56%), 25 cases were performed between 41 and 60 years (25%) of age, 15 cases were between 0 and 20 years (15%), and 4 cases between 60 and 80 years (4%) of age. A study by Choudhury *et al.*,<sup>[9]</sup> the mean age of elective TR was 40.46 years and mean age of emergency TR was 50.50 years. In this study, most common indication was malignancy; hence, the mean age for TR was higher. In a study by Santosh,<sup>[10]</sup> a total of 100 patients underwent bedside TR during the course of MV. The youngest patient was 18 years old, and the oldest patient was 85 years old. A study was conducted by Kodiya *et al.* at Nigeria<sup>[11]</sup>: A total of 111 cases were analyzed, 79 (71.2%) males and 32 (28.8%) females with an male:female ratio of 2.5:1, age ranged between 2 months and 75 years, mean age was 29.4.

**Sex Distribution**

In the present study out of 100 cases, 65 were males and 35 were females with a male: female ratio of 1.85:1. Maximum cases were reported in the age group of 25–45years [Table 13].

In a study by Crysdale *et al.*<sup>[16]</sup> in 1976–1985 study also revealed more males than females who underwent TR. In a study by Santosh *et al.*,<sup>[10]</sup> a total of 100 patients underwent bedside tracheostomies during the course of MV. In the study group, 78 patients were male and 22 were female with male to female ratio of 3.5:1.

**Table 7: Age distribution in SV poisoning (n-18)**

Age	Number of cases - 18
0–10	0
11–20	4
21–30	9
31–40	4
41–50	0
51–60	1

SV: Super Vasmol

**Table 8: Sex distribution in SV poisoning**

Number of cases	Male	Female
18	2	16

**Table 9: Prognosis in SV poisoning (n-18)**

Total number of cases	Decannulation	Death
18	17–94.44%	1

**Table 10: Complications versus type of TR (n-100)**

Complications	Emergency (%)	Elective (%)	<i>P</i> value
Present	15 (29.4)	05 (10.2)	0.008
Absent	36	44	

TR: Tracheostomy

**Table 11: Complications in present series**

Complications	Emergency	Elective
Bleeding	2	0
Tubal blockade	4	1
Infection	2	1
Surgical emphysema	2	1
Stomal granulation	2	1
Tracheal stenosis	2	1
Difficult decannulation	1	0

**Table 12: Type of complications**

Complications	Number of cases
Early	2
Intermediate	11–21.15%
Late	7–13.46%

**Table 13: A comparative study of tracheostomies showing the ratio between males and females**

Authors	Ratio between males and females
Amusa <i>et al.</i> <sup>[12]</sup>	3:1
Eziyi <i>et al.</i> <sup>[13]</sup>	2.8:1
Okafor <sup>[14]</sup>	1.4:1
Esen <i>et al.</i> <sup>[15]</sup>	2.3:1
Present study	1.85:1

### Type of Tracheostomy

Both elective and emergency tracheostomies were performed. Elective tracheostomies were performed at the bedside in the patients admitted in ICU with prolonged MV. Emergency TR was performed at emergency OT in the patients coming to the outpatient department of otorhinolaryngology and causality with upper airway obstruction. In this study, the indications for TR were broadly divided into two groups, elective 49 cases (49%), and emergency 51 cases (51%) [Table 14].

In all the above studies, emergency TR was more common than elective TR which is similar to our present study.

### Indications

TR was thought as an important life-saving procedure in many conditions and has now become a well-established procedure with more specific indications. In the present study, various indications of elective TR are head injury in 27%, OP poisoning in 20%, and GB syndrome in 2%. Indications for TR include the need for long-term MV and tracheal toilet. Various indications of emergency TR are SV poisoning in 18%, malignancies in 18%, diphtheritic tonsillitis in 2%, cutthroat in 3%, hanging in 3%, tracheal stenosis in 3%, post-RT in 2%, and JLP in 2%. TR was performed in such conditions as acute angioedema and inflammation of the head and neck, neck cancers, cutthroat repair, neck trauma, and congenital tumors of head and neck.

### Elective TR

The elective group included patients who required prolonged MV (27 cases of Head Injury, 20 cases of OP Poisoning, and 2 cases of Guillain-Barre Syndrome). In the past, TR used to be reserved for severely ill patient with acute respiratory obstruction. In a series by Goodall *et al.*,<sup>[17]</sup> and Goodall *et al.*,<sup>[18]</sup> the chief indications were acute inflammations of the pharynx and larynx and the removal of the foreign bodies. In the present series, only 2% tracheostomies were done for diphtheria and none for poliomyelitis. The indications such as diphtheria and acute laryngotracheobronchitis poliomyelitis in children are becoming rare with the advent of antibiotics and steroids and prophylactic immunization. Gradually, the indications for TR have been widened to include tracheobronchial toilet, intermittent positive pressure ventilation, protection against inhalation of foreign body, and reduction of dead space. In the studies done by Crysdale *et al.*<sup>[17]</sup> in 1976–1985, 319 cases were taken up in the study. In this study, 222 cases (70%) were of airway obstruction,

65 cases (20%) were of the tracheobronchial toilet, and 32 cases (10%) were of continued assisted ventilation. In a retrospective study of 1130 cases by Goldenberg *et al.*,<sup>[19]</sup> the most common indication was for long-term MV (76%) which is the same as our study. According to Griffiths *et al.*<sup>[20]</sup> and Delaney *et al.*<sup>[21]</sup> TR is a surgical procedure which is increasingly being performed in ICU rather than operative rooms. In the present study, 49% of tracheostomies are performed in ICU. In a study by Choudhury *et al.*,<sup>[9]</sup> the common indications of elective TR were intracranial space occupying lesion (26.67%) and head injury (26.67%); other indications were pre-operative TR for carcinoma mandible, Guillain-Barre syndrome, cerebrovascular accidents, etc. In a study, Santosh *et al.*,<sup>[10]</sup> during the study period total of 100 patients underwent bedside TR during the course of MV. Reasons for MV in above patients included polytrauma, head injury, OP poisoning, hanging, and stroke, multi-organ failure with septicemia, dengue encephalitis, acute respiratory distress syndrome, and rheumatic heart disease in respiratory failure. In the present study, reasons for prolonged MV are head injury, OP poisoning, and GB syndrome.

### Emergency TR

In this study, emergency group included patients with stridor due to SV poisoning 18 cases, malignancy of larynx/hypopharynx 18 cases, acute infections of larynx 2 cases, post-intubation stenosis 3 cases, and cutthroat injuries hanging 3 cases, post-RT 2 cases, and JLP 2 cases.

Categorizations of indications differ in different studies. In a series by Goodall *et al.*,<sup>[18]</sup> the chief indications were acute inflammations of the pharynx and larynx and the removal of the foreign bodies. A study by Okafor<sup>[14]</sup> revealed the three most common indications to be carcinoma of the larynx (25%), foreign body aspiration (21.2%), and iatrogenic bilateral vocal cord paralysis (9.6%). In a study by Amusa *et al.*,<sup>[12]</sup> it was trauma (34.1%), infections (29.5%), and carcinoma of the larynx (11.4%). In a study by Choudhury *et al.*,<sup>[9]</sup> the most common indications for emergency TR were laryngeal carcinoma (53.33%). It was followed by advanced hypopharyngeal carcinoma (13.33%). In the present study, 36% of emergency tracheostomies are performed for head and neck malignancies. Among malignancies 18 cases, 14 cases were carcinoma larynx, and 4 cases were carcinoma hypopharynx. Indications vary with regions depending on culture, weather, occupation, and literacy levels. In the present study, 36% emergency tracheostomies are performed for SV poisoning.

### Head Injury

In the present study among elective tracheostomies most common indication was head injury (55.10%) due to prolonged MV. Head injuries are more common in 30–40 years age group (55.5%). It was more common among

**Table 14: A comparative study between elective and emergency tracheostomies from literature**

Authors	Emergency	Elective
Kodiya <sup>[11]</sup>	69.4%	30.6%
Eziyi <i>et al.</i> <sup>[13]</sup>	62.5%	37.5%
Present study	51%	49%

males (88.8%). Among head injuries, elective TR done to Glasgow Coma Scale <8 and ISS >25 and ventilatory days >7 is more likely to require TR. TR is performed as an attempt to decrease morbidity and length of the stay. To avoid secondary brain injury from hypoxia and to provide a secure airway TR was done. TR provides a secure airway and facilitates airway suctioning, mouth care, and patient morbidity. Furthermore, TR decreases the damage to the vocal cords seen with endotracheal tubes. The patients with severe head injury are at risk of developing respiratory complications, adversely affecting the outcome and survival. An important factor contributing to the high mortality in patients with severe head injury is cerebral hypoxia. The MV helps both by reduction in the intracranial pressure and hypoxia. Ventilatory support also required in these patients due to the patient's inability to protect the airway, persistence of excessive secretions, and inadequacy of spontaneous ventilation. Controversy exists over the indications and timing of TR in patients with traumatic brain injury. To avoid secondary brain injury from hypoxia and to provide a secure airway most patients with Glasgow Coma Score <8 are intubated and ventilated in the trauma bay during their evaluation and resuscitation. Early and late TR was both recommended in the literature. The time range recommended for conversion to TR was from 3 days to 21 days. Advocates of early TR (within one and 7 days) claim the advantage of lower incidence of pneumonia and shorter duration of MV, ICU stay, and hospital stay. TR provides a secure airway and facilitates airway suctioning, mouth care, and patient mobility. Furthermore, TR decreases the damage to the vocal cords seen with endotracheal tubes. Advocates of late TR claim the avoidance of unnecessary operations in patients with an uncertain prognosis.

### Future Directions

Although the surgical method of TR is less likely to have marked enhancements, gains may be realized in other areas such as the decision-making process. We can further hone the tenets of medical ethics, further stratify risk (both short- and long-term), and refine our understanding of overall patient benefits. The gain is in maximizing judicious use of palliative TR. To arrive at this without compromising long-term outcomes while improving the quality of remaining life would be highly desirable.

### SV Poisoning

Among emergency TR 51 cases, the most common indication was SV poisoning 18 cases (35.29%) and malignancies 18 cases (35.29%). SV poisoning is more common in 21–30 years (50%). It is common among females (88.8%). In a retrospective study by Soni *et al.*,<sup>[23]</sup> out of 13, 11 patients were women and the mean age was 27.2 years. Hair dye poisoning with Super Vasmol 33(SV 33), is a commonly used liquid hair dye, cheap, freely available in the market and easily

accessible for consumption. Hence, it is a major cause of suicidal poisoning in India. The characteristic triad of clinical features encountered is angioneurotic edema with stridor, rhabdomyolysis with chocolate colored urine and acute renal failure. Leukocytosis with neutrophilia, hemoglobinuria, myoglobinuria, and increased CPK (creatinine phosphor kinase) was observed. No specific antidote for parphenylenediamine; hence, management is only symptomatic and supportive with immediate TR. In the present study, out of 18 cases, 13 cases are between 20 and 40 years age group (72.22%). There was female preponderance of 77% as per Filali *et al.*,<sup>[24]</sup> 80.7% as per Hamdouk,<sup>[25]</sup> and 74.86% as per Jain *et al.*<sup>[26]</sup> In the present study, it was 89% which correlates with the study by Hamdouk *et al.*<sup>[25]</sup> Incidence is common in females (M: F - 1: 8). 5–10 ml SV 33 can cause laryngeal edema due to the direct toxic effect of PPD on mucous membranes. Rapid development of severe edema of the face, neck, pharynx, and larynx with respiratory distress was observed. Tongue is dry and wooden - hard and swollen due to edema, often requires TR. High mortality noticed with this poisoning. 42% of mortality occurs within 24 h of diagnosis.<sup>[59]</sup> Mortality rate was 21.1% as per Filali *et al.*<sup>[24]</sup> and it was 6.8% in Radhika.<sup>[27]</sup> In the present study, the mortality rate after TR is reduced showing the importance of early intervention with emergency TR. Corroboration of different specialties required for ideal management that is ENT, anesthesia, medicine and lab medicine. Mortality rate was lowered by 12% possibly due to the availability of dialysis facilities and early therapeutic intervention and collaboration with ENT departments. It is important that medical personnel should be aware of this poisoning and early therapeutic intervention can avoid fatality.

### Prognosis in SV Poisoning

Out of 18 cases of SVP, 1 case died due to renal failure and remaining 17 cases were decannulated. In the present study, the mortality rate after TR is 5.5% showing the importance of early intervention with emergency TR. In a study by Radhika,<sup>[27]</sup> mortality rate was 6.8% correlating with the present study.

### Complications of TR

In the present study, out of 100 cases of TR rate of complication were 20%. Most retrospective studies have assessed the overall incidence of complications, and these ranged from 5% to 40%. In a study by Rahman *et al.*,<sup>[28]</sup> the rate of complications was 39.05%. The complications in this study are within the range of other studies. The rate of complications was similar to previous studies carried at other places.<sup>[27,28]</sup>

Author	Rate of complications (%)
Rahman <i>et al.</i> <sup>[28]</sup>	39.05
Ahmed <i>et al.</i> <sup>[29]</sup>	41
Rahman <i>et al.</i> <sup>[28]</sup>	58.62
present study	20

**Complications Verses Type of TR**

Out of 51 cases of emergency tracheostomies, 15 (29.4%) developed complications while out of 49 cases of elective tracheostomies 5 (10.2%) developed complications. In the present study, the rate of complications was 3 times more common in cases of emergency TR than an elective tracheotomy. Chi-square test was done. The proportion of complications in emergency TR (29.4%) is more compared to proportion of complications in elective TR (10.2%); p value=0.008 which is statistically significant. In a previous study by Graham *et al.*,<sup>[30]</sup> 1996, on elective tracheotomy showed that the rate of complications is 8.94%. In a study by Wax *et al.*,<sup>[31]</sup> 1999, on the elective TR rate of complications was 19.64%. In a study by Rahman *et al.*<sup>[28]</sup> showed that complications were more common in cases of emergency tracheotomy (43.26%) than in cases in elective TR (17.8%). In a study by Choudhary *et al.*,<sup>[9]</sup> 2008, the complications were more common in cases of emergency TR (33.35%) than in cases of elective tracheotomy (9.99%); the difference is statistically significant. In the present study, the rate of complications is similar to the above studies. In the present study, the rate of complications was 3 times more common in cases of emergency TR than an elective tracheotomy. In a study by Rahman *et al.*,<sup>[28]</sup> 2001, the complications were 2.42 times more common in cases of emergency tracheotomy than routine ones. In study by Choudhury *et al.*,<sup>[9]</sup> 2008, the complications were 3.33 times more common in cases of emergency TR than elective TR. It is recognized that emergency tracheotomy carries 2–5 fold increase in the incidence of complication over an elective procedure. The rate of complications did not show association with the nature of pathological conditions necessitating tracheotomy. Mortality due to complications in TR: No mortality due to complications of TR in the present study. In a study by Rahman *et al.*,<sup>[28]</sup> 2001, mortality due to complications of TR was 1.78%. The fatalities were due to tube displacement and tube blockage.<sup>[10]</sup> In review of literature, the death rate was found to range from 0.50% to 1.60%, and most often it was caused by hemorrhage or tube displacement. In some other studies, the death rate was found to be 1.00%, 0.49%, and 1.78%. In this study, no death both from elective and emergency tracheotomy.<sup>[33]</sup>

Author	Mortality due to TR (%)
Amusa <i>et al.</i> <sup>[12]</sup>	25
Eziya <i>et al.</i> <sup>[13]</sup>	0.0
Okafor	3.8
Rahman <i>et al.</i> <sup>[27]</sup>	1.78
Wease <i>et al.</i> <sup>[30]</sup>	0.49
Shinkwin and Gibbin <sup>[31]</sup>	1.78
Choudhury <i>et al.</i> <sup>[9]</sup>	1.67
Present study	0.00

TR: Tracheostomy

**Complications in Present Series**

In the present study, out of 51 cases of the emergency tracheostomies, 15 (29.4%) developed complications while out of 49 cases of elective tracheostomies, 5 (10.2%) developed complications. Overall, 20 cases of complications were recorded, consisting of 5 cases with tubal blockade, 3 cases of stomal granulation, 3 cases of infection, 3 cases of surgical emphysema, 3 cases of tracheal stenosis, 2 cases of bleeding, and 1 case with difficulty decannulation. There was nil mortality related to TR. Tube obstruction was encountered in 5 cases. Three cases were due to blood clots and two had thick mucus plug obstructing the lumen which led to severe asphyxia, but this was promptly recognized and managed. Tube obstruction is common in the immediate post-operative period (i.e. first 24 h), failure of attentive care may lead to severe asphyxia and even death [Table 15].

Granulations of stoma are a consequence of the wound being exposed to bacteria and mechanical irritation as a result of tube motion. Debridements of granulations were done during regular follow-up in the minor OT. Exuberant granulations were cauterized with silver nitrate or copper sulfate crystals. In a series by Yaremchuk *et al.*,<sup>[32]</sup> a policy requiring routine change of TR tubes results in fewer complications from granulation tissues. Regular changing of TR tube prevents granulation tissue and its complications. Wound infection was found in 3% cases both in elective and emergency TR. Infection of TR developed in 3 cases, 1 case developed bacterial pneumonitis which was treated with appropriate antibiotics. This complication can be avoided by maintaining sterility of the stoma site and neck [Table 16].

In a previous study Rahman *et al.*,<sup>[28]</sup> it was 2.96% of cases with wound infection. In a study by Westphal *et al.*,<sup>[35]</sup> bacterial contaminations in the neck wound were found in 35% of cases in open TR. Fortunately, infection in the

**Table 15: Comparative study of emergency and elective tracheostomies**

Author	Tubal blockage (%)
Amusa <i>et al.</i> <sup>[12]</sup>	25
Eziya <i>et al.</i> <sup>[13]</sup>	0.0
Okafor <sup>[16]</sup>	3.8

**Table 16: Comparative study of emergency and elective tracheostomies**

Author	Wound infection (%)
Rahman <i>et al.</i> <sup>[28]</sup>	1.78
Wease <i>et al.</i> <sup>[33]</sup>	0.49
Shinkwin and Gibbin <sup>[34]</sup>	
Choudhury <i>et al.</i> <sup>[9]</sup>	

neck in TR is local, indolent and produces local cellulitis with In a series by Yamada *et al.*,<sup>[32]</sup> a policy requiring routine change of TR tubes results in fewer complications from granulation tissues.. Antibiotics are seldom necessary as the wound is open and drainage is adequate. Surgical emphysema was found in 3 cases. In a previous study by Rahman *et al.*,<sup>[28]</sup> surgical emphysema constitutes (9.47%). In a study by Choudhury *et al.*,<sup>[9]</sup> surgical emphysema was found in 6.6% [Table 17].

Subcutaneous emphysema can be alarming but is seldom fatal. It is mostly confined to the neck but can extend to the face and chest wall. It usually presents within the 1<sup>st</sup> day and is self-limiting by the 7<sup>th</sup> day, unless the precipitating factors persist. Occasionally extensive subcutaneous emphysema may develop which requires multiple needle punctures to relieve the trapped air. Bleeding is found in 2 cases. 1 case had bleeding at the time of surgery. It was controlled by cauterization. 1 case had post-operative bleeding controlled with the application of pressure pack. In a previous study, the second the common complication was hemorrhage (5.33%).<sup>[27]</sup> In other studies, it was found to be 3.7% and 5.0% hemorrhage is most commonly arising from anterior jugular veins and thyroid gland [Table 18].<sup>[1]</sup>

Difficulty decannulation was encountered in 1 patient. There were three cases of tracheal narrowing found in the present study. Tracheostoma stenosis is a distressing complications.<sup>[34]</sup> Stenosis occurs at three levels the stoma, the cuff site or the tip of the tube. The majority of the cases result from the pressure of the inflatable cuff on the trachea. Most nonmalignant upper tracheal stenosis was caused by prolonged endotracheal intubation or TR.<sup>[32]</sup> According to another author, some tracheal narrowing is demonstrated in more often seen near the site of stoma<sup>33</sup>. The incidence of complications varies in different author's series. In Goldenberg *et al.*<sup>[19]</sup> study complications occurred in 49 (4.3%) cases, most common was tracheal stenosis

(21 cases), hemorrhage (9 cases) tracheocutaneous fistula (6 cases), infection (5 cases), and tube obstruction(4 cases).

**Type of Complications**

In the present study, early complications presented in two cases, intermediate complications in 12 cases and late complications in 7 cases. In a retrospective study of hospital records of 43 tracheostomized patients by Ass AS at Scandinavia (1975) revealed: Early complications of one tube occlusion (2.3%), one dislocated tube (2.3%), one bilateral pneumothorax (2.3%), and one case of fatal innominate arterial hemorrhage (2.3%). Late complications included tracheal stenosis (40–60%).<sup>[35]</sup>

**CONCLUSION**

Tracheostomies were performed more often in men than in women in the ratio of 1.85: 1. Both elective and emergency TR was performed, and emergency TR (51%) was more common than elective TR (49%). Various indications of TR are head injury (27%), OP poisoning (20%), GB Syndrome (2%), SV poisoning (18%), carcinoma head and neck (18%), diphtheritic tonsillitis (2%), cutthroat (3%), hanging (3%), tracheal stenosis (3%), post-RT (2%), and juvenile laryngeal papillomatosis (2%). TR can be done safely under local anesthesia. In all emergencies, the skin incision should be a vertical incision. Various complications were the formation of granulation tissue around tracheostoma (3 cases), tube obstruction (5 cases), hemorrhage in (2 cases), surgical emphysema (3 cases), stoma infection (3 cases), difficult decannulation (1 case), and tracheal narrowing (3 cases). There were no deaths related to TR. Complications following emergency TR were 3 times more common than elective TR. Mortality due to TR is nil. These numbers represent very low rate when compared to previous studies, that is, first 24 h is important in the management of tracheostomized patient during which patient may go for tubal obstruction due to increased secretion and blood clots in tubes and trachea which has to be continuously monitored and prevented by doing frequent suction and cleaning the tube, control hemorrhage, and prevent aspiration. TR is a life surgical procedure that is not devoid of complications; however, most of the complications can be avoided with meticulous technique, adequate, and appropriate post-operative care.

**Table 17: A comparative study between elective and emergency tracheostomies from literature**

Author	Surgical emphysema (%)
Rahman <i>et al.</i> <sup>[28]</sup>	9.47
Choudhury <i>et al.</i> <sup>[9]</sup>	6.6
Present study	3

**Table 18: A comparative study between elective and emergency tracheostomies from literature**

Author	Hemorrhage (%)
Rahman <i>et al.</i> <sup>[28]</sup>	5.33
Choudhury <i>et al.</i> <sup>[9]</sup>	5
Present study	2

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