

Assessments of the Practice and Knowledge of Health Professionals toward Tracheostomy for Patients Admitted to ICU in Ethiopian Hospitals

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ABSTRACT

Background: Tracheostomy is a surgical procedure commonly done in intensive care unit patients to facilitate weaning and to fasten the recovery process. More than 10% of mechanically ventilated patients require tracheostomy. The practice and knowledge of health professionals toward tracheostomy are left undisclosed and not well stated in Ethiopia.

Materials and methods: This descriptive multicenter cross-sectional study was conducted with chart review and prospective evaluation of ICU health professionals' knowledge regarding the practice of tracheostomy. This study was collected after distributing 24-item standard questionnaires to all health professionals who were working in surgical and medical intensive care units of Amhara regional comprehensive specialized hospitals (CSHs). All the data were entered and analyzed with SPSS version 25. Descriptive statistics, figures, and tables were used to present the data.

Result: A total of 625 tracheostomies were done in our 3-year retrospective studies of 10 intensive care units of Amhara regional CSHs. We found that surgical tracheostomy was the commonest technique practiced currently in our setup. The majority of tracheostomy procedures were performed in the operation theater.

Conclusion: Percutaneous tracheostomy was under-practiced in Amhara regional CSHs. The decision time to proceed with a tracheostomy was late, which was after 14 days of postintubation, in most cases. The knowledge of health professionals, who were working in intensive care units, regarding tracheostomy, was poor.

Clinical significance: This study is one of the important areas in addressing peculiar gaps in the tracheostomy practice for mechanically ventilated patients in ICU, especially in low-income countries where tracheostomy-related complication is high. Knowing the practice and health professional's knowledge toward tracheostomy is among the most important area of ICU care in medicine, and there is no previous published work within this regard in Ethiopia and in Africa.

Keywords: Acute respiratory failure, Artificial airway, Intensive care, Mechanical ventilation, Tracheostomy.

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BACKGROUND

Tracheostomy is a surgical procedure performed to create anterior opening or communication between the trachea and its overlying skin.¹ As a study report, among patients admitted to ICU, around 2–11% of patients requiring mechanical ventilation receive a tracheostomy.² Some of the complications associated with prolonged MV and intubation are delayed weaning process, prolonged hospital stay, wasting resources, more sedation requirements, and increased mortality and morbidity risks.³

Tracheostomy resolves major problems associated with prolonged intubation and mechanical ventilation.⁴ This can be done by either with percutaneous or open surgical techniques.⁵ As studies showed, both techniques have been previously practiced in different areas of the world and there is much heterogeneity across the studies regarding the reported practice.⁶ The type of tracheostomy techniques we are following in our study areas as well as at the country level are not known due to a lack of previous studies. As studies from abroad showed, the recent development of percutaneous techniques for tracheostomy placement has popularized the use of this procedure due to its simplicity of execution, rapid placement, better cosmetics result, and very low complication rates compared to surgical techniques.^{7–9}

There are different indications to do a tracheostomy in the hospital. The variables can be varied according to patient condition

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and its contributors.¹⁰ It is usually done for the management of airway obstruction, pulmonary hygiene, respiratory support, and the elimination of dead space. The advantages of tracheostomy include ease of communication, patient safety, comfort, and better airway care.¹¹

Although tracheostomy remains one of the most common procedures performed in the intensive care setting, its exact indications and timing also remain controversial.¹² Surveys from the United Kingdom and France also documented variability for both the timing and the indications for tracheostomy.² Based on some studies report, patients who undergone early tracheostomy

(within 5–7 days of intubation) shown to have shorter intensive care unit stays, hospital stays, and better MV compared with those patients done after 7 days of intubation.^{13,14} Other studies also defined early tracheostomy when it is performed within 10 days of admission and late tracheostomy as when it is secured after 10 days of MV.² One of the consequences of late tracheostomy is prolonged MV and delayed ICU stay.¹⁵ There is also a single study that showed early tracheostomy did not improve patient outcomes.¹²

Complication after tracheostomy is common. As different studies showed, the rate of complications after standard tracheostomies, such as bleeding, infection, and pneumothorax, has ranged widely from 2 to 66%, with the higher rates occurring in earlier procedural time.¹⁶ Even though there were different worldwide reports, the magnitude of post-tracheostomy complications is not still well understood in our study areas.

Tracheostomy is usually recommended in elective conditions. If it is performed under emergency conditions, it is difficult, time-consuming, and often associated with a poorer outcome. Surgical cricothyroidotomy is usually preferred during emergency airway conditions.¹⁷ Recently, percutaneous dilational tracheostomy has been reported to be successful under emergency circumstances. However, it is premature to recommend its advantage in all emergencies.¹⁸

Many critical patients are admitted to both medical and surgical ICU in seven Amhara regional CSHs. There are no previous studies conducted in those study areas regarding the practice and knowledge of health professionals toward tracheostomy for patients admitted to ICU in Amhara regional CSHs. Our study is the first in Amhara regional-state CSHs as well in Ethiopia.

So, knowing the practice and knowledge of health professionals toward tracheostomy for patients admitted to ICU will help us to identify the current gap and to improve quality services. It will also help to initiate to do other studies and to develop local guidelines in those Amhara regional CSHs.

AIM OF THE STUDY

To assess the practice and knowledge of health professionals toward tracheostomy for patients admitted to ICU of Amhara regional CSHs, Northwest Ethiopia.

MATERIALS AND METHODS

This descriptive multicenter cross-sectional study was conducted with a retrospective chart review combined with the prospective evaluation of ICU health professionals' knowledge regarding the practice of tracheostomy. This study was performed from May 25, 2021, to June 25, 2021, and 3-year (from June 25, 2018, to July 2021) retrospective analysis was done. This study was already registered at researchregistry.com with a unique identifying number of 7212.

We have got ethical approval from Debre Tabor University ethical review committee, and they informed us to proceed with data collection. Informed consent was obtained from all individual participants included in the study. The voluntariness of each clinician for participation in this study were also asked before proceeding with data collection.

Before proceeding with this study, we use a sample survey study published by Kluge et al. in 2008 with a standard questionnaire.¹⁹ To ensure the clarity and validity of the assessment tool, three experts from senior health professionals reviewed and pretested in the

ICU outside our study areas. The questionnaire aimed to obtain information regarding the ICU's and the hospital's demographics, the timing of tracheostomy, the technique applied, indication for tracheostomy, overall practice of tracheostomy, availability of local guidelines, the use of endoscopic guidance, and the follow-up protocols. The health professionals were further asked to give their opinion as to whether surgical tracheostomy or percutaneous tracheostomy is the method of choice for patients requiring long-term ventilation and which of these techniques is safer. This descriptive study was collected after distributing 24-item standard questionnaires to all health professionals who were working in surgical and medical ICU of those above-listed CSHs.

Data collectors were three well-trained senior anesthetists, who were not working in the ICU.

A total of 10 intensive care units were included in our study (3 out of 10 were pediatric ICUs). The total numbers of health professionals who are working in the above-listed 10 ICUs were 192. Among those professionals, 24 of them were senior physicians and 30 were general practitioners (GP), whereas 33 out of the total were anesthetists and 105 of them were ICU nurses.

All eligible tracheostomy patients performed in the surgical, medical, and pediatrics intensive care units of all Amhara regional CSHs within the study period were included.

Those patients who had tracheostomy *in situ* before admission to ICU were excluded from the study. Health professionals who were not available in the working area during the data collection period, those health professionals who refuse to give information, and those on yearly break were excluded.

Operational Definition

- **Early tracheostomy:** Tracheostomy done <7 days of admission to ICU and mechanical ventilation.²⁰
- **Late tracheostomy:** Tracheostomy done >7 days after admission to ICU and mechanical ventilation.²⁰
- **Prolonged mechanical ventilation:** Defined as ventilation provided for 24 hours to 21 consecutive days, with at least 6 or more hours per day.²¹
- **Percutaneous tracheostomy:** A technique in which a guidewire is inserted to the airway after piercing the trachea using a hollow needle. Then, dilatation over the wire and eventual placement of the tracheostomy tube is performed.²²
- **Surgical tracheostomy:** A technique to establish access to the anterior trachea by creating a small surgical incision for insertion of tracheostomy tube without the use of guidewire.²³

Data Analysis and Interpretation

All the data were entered and analyzed with SPSS version 25. For this cross-sectional study, descriptive statistics, figures, and tables were used to present the data. The data were presented as mean \pm standard deviation for the data that were normally distributed or as median (range) for data that were outside the normal distribution.

RESULT

Demographic Characteristics of Hospitals and ICU

Data were collected by interviewing health professionals working in ICUs and using a 3-year retrospective chart review. The response rates of health professionals were 91.7%. Among the included ICUs, five of them were from university teaching hospitals, which accounted for 65% of the responding ICUs and the remaining five (5)

ICUs were from nonteaching CSHs, which accounted for 35% of our study respondents. Among the ICUs selected, seven centers were overrun by the internal medicine department and two ICUs lead by the anesthesia department. The remaining one is monitored by mixed professions. More than 10,000 beds are available on average in all CSHs. Among the 10 ICUs of 7 CSHs, 06 had 1–8 beds, 03 ICUs had 9–12 beds for each, and 01 ICU had 13–16 ICU beds. The average yearly admission rates of patients in all ICU were 1,000–2,000 cases. Among those, 10–20% of ICU admitted patients need mechanical ventilation and out of them, 40% need tracheostomy tube insertion for long-term ventilation.

From our retrospective chart review, on average 72–120 tracheostomy procedures were done in the past 3 years in each hospital. The mean ages of patients were 45.32 ± 22.86 . From the total of 625 tracheostomy patients performed in 10 ICU centers, 476 were males and 149 of them were females. The most common indications of tracheostomy were respiratory failure secondary to infection (60%), upper airway obstruction (20%), airway protection (10%), failed weaning from MV (8%), and copious airway secretion (2%).

The commonest types of tracheostomy practiced in Amhara regional CSHs were surgical tracheostomy 500 (80%). Percutaneous tracheostomy was only practiced in 94 (15%) of patients. Ciaglia type of tracheostomy was commonly used in percutaneous techniques. Mini-tracheostomy was done only in 32 (5%) of admitted cases. All tracheostomy procedures were done by surgeons in all CSHs. Among all the tracheostomies performed, 70% of the procedures were done in operation theater. The remaining 30% of tracheostomies were performed in ICU. A fenestrated cannula was usually used in 95% of cases. Tracheostomy care was commonly performed everywhere until the stoma closed both in ICU and on the nursing wards. Regarding the timing of tracheostomy, 259 (41.44%) of cases were performed within 15–21 days of the postintubation period, whereas 178 (28.5%) were done during the first 8–14 days of the mechanical ventilation period (Fig. 1).

A total of 625 tracheostomies were done in our 3-year retrospective studies of 10 intensive care units of Amhara regional CSHs. The majority of the tracheostomy cases (120 (19.2%)) were from the UOGCSH. Among those, 94 cases were done with a surgical tracheostomy, and the remaining 26 cases were done under percutaneous techniques. Among the total patients done under

percutaneous techniques at UOGCSH, 16 (61.5%) performed with the help of endoscopic guidance. A local guideline is available only on two hospital ICUs (Table 1).

Regarding opinions of responding health professionals, 78 (44.31%) were preferred percutaneous tracheostomy as a better tracheostomy technique, whereas 64 (36.36%) are interested in surgical tracheostomy. On the contrary, 90 (51.14%) of health professions strongly agree percutaneous tracheostomy is safer compared to surgical techniques, whereas 31 (17.6%) of health professions strongly disagree with this idea. Among the health professionals working in ICU, 88 (50%) were not familiar with the indications to use mini-tracheostomy in their working areas (Table 2).

DISCUSSION

A descriptive multicenter cross-sectional study was done among 10 ICUs of 7 CSHs in the Amhara region. In this study, we found that 80% of tracheostomy procedures were performed under surgical techniques and 15% with percutaneous type. Regarding the timing of tracheostomy, most of the procedures (41.4%) were done within 15–21 days of the mechanical ventilation period and 28.5% of tracheostomies were secured during the first 8–14 days of postintubation time. The remaining 21 and 9.1% of tracheostomy procedures were done during the first 7 days and after 21 days of MV, respectively.

Regarding tracheostomy practice, there was limited availability of local guidelines and endoscopic instruments in ICUs. We also found that the most common indications for tracheostomy in our setup were acute respiratory failure secondary to infection (60%) and upper airway obstruction (20%).

A study showed that about 10–11% of critically ill patients admitted to ICU receiving mechanical ventilation require tracheostomy,²⁴ whereas the result of our study showed that around 40% of mechanically ventilated patients were need tracheostomy. Our study showed a higher result compared with the above study. This variation might be due to the lack of invasive respiratory monitors and senior intensivists in our setup, which will maximize the complication rate and ICU stay.

A study in Singapore showed that early tracheostomy performed before 7 days results in rapid weaning from mechanical ventilation and enables the decreased rate of complications.²⁵ Contrary to this, our study showed that the majority of tracheostomies (41.4%) were performed within 15–21 days of the MV period and only 21% of patients were done within the first 7 days of MV. This delay in tracheostomy time in our study areas might be due to poor decision processes by health professions working in ICU and the limited availability of tracheostomy tubes, which will prolong decision time.

Based on our study, the commonest indications for tracheostomy were a respiratory failure, upper airway obstruction, and airway secretion. This study was supported by an observational study done in 2001, which showed that the main indications of tracheostomy during MV after ICU admission was a chronic respiratory failure.²⁶

Similarly, in our study, majority of the tracheostomy procedures (80%) were done under surgical techniques and 15% of a case performed with percutaneous tracheostomy techniques. In line with our result, a survey study done in Switzerland showed that 69% of tracheostomy procedures were performed under surgical techniques and 57% were done with percutaneous techniques. Based on this study, the decision to perform tracheostomy was mostly made by intensivists,²⁷ whereas, in our study, the overall decision to proceed with a tracheostomy was multidisciplinary.

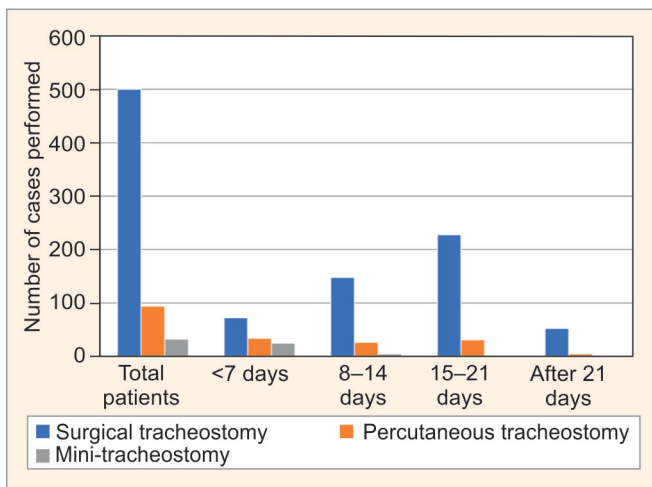


Fig. 1: Bar graph shows the types of tracheostomy performed with their respected time at all CSHs of ICU center, in Amhara region, Ethiopia

Table 1: The practice and distributions of total tracheostomy cases performed in different CSHs of Amhara region, Ethiopia

<i>Variables related to the practice of tracheostomy</i>	<i>Yes</i>	<i>No</i>	<i>Total TR cases performed</i>
Do you routinely use endoscopic guidance during percutaneous tracheostomy?			
DTCSH	6 (75%)	2 (25%)	8 (100%)
FHCSH	8 (66.7%)	4 (33.3%)	12 (100)
TGCSH	11 (78.6%)	3 (21.4%)	14 (100%)
UOGCSH	16 (61.5%)	10 (38.5%)	26 (100%)
DMCSH	6 (66.7%)	3 (33.3%)	9 (100%)
DCSH	8 (61.5%)	5 (38.5%)	13 (100%)
DBCSH	10 (83.3%)	2 (16.7%)	12 (100%)
Do you routinely perform a follow-up of your tracheostomy patient?			
DTCSH	92 (91.1%)	9 (8.9%)	101 (100%)
FHCSH	77 (87.5%)	11 (12.5%)	88 (100%)
TGCSH	66 (91.7%)	6 (8.3%)	72 (100%)
UOGCSH	118 (98.3%)	2 (1.7%)	120 (100%)
DMCSH	78 (91.8%)	7 (8.2%)	85 (100%)
DCSH	69 (92%)	6 (8%)	75 (100%)
DBCSH	63 (75%)	21 (25%)	84 (100%)
Are local guidelines available in ICU regarding the indication, timing, and method of tracheostomy?			
DTCSH		No	
FHCSH		No	
TGCSH	Yes		
UOGCSH	Yes		
DMCSH		No	
DCSH		No	
DBCSH		No	

DTCSH, Debre Tabor comprehensive specialized hospital; DMCSH, Debre Markos comprehensive specialized hospital; DCSH, Dessie comprehensive specialized hospital; DBCSH, Debre Birhan comprehensive specialized hospital; FHCSH, Felege-Hiwot comprehensive specialized hospital; TGCSH, Tibebe Ghion comprehensive specialized hospital; UOGCSH, University of Gondar comprehensive specialized hospital; TR, tracheostomy

Table 2: Knowledge-related questions with their response from a total of 176 health professionals who were working in the ICU of our study areas, in the Amhara region, Ethiopia

<i>Health professionals knowledge-related variables</i>	<i>Responses (n)</i>	<i>Percentage (%)</i>
In your opinion, what is the method of choice for an elective tracheostomy in ICU patients requiring long-term ventilation?		
Surgical tracheostomy	64	36.36%
Percutaneous tracheostomy	78	44.31%
No difference	30	17%
No opinion	4	2.27%
Percutaneous tracheostomy is safer than surgical tracheostomy		
Strongly agree	90	51.14%
Agree	18	10.23%
Neutral	12	6.8%
Disagree	25	14.2%
Strongly disagree	31	17.6%
Percutaneous tracheostomy is the method of the first choice		
Strongly agree	67	38.1%
Agree	52	29.55%
Neutral	10	5.7%
Disagree	28	15.9%
Strongly disagree	19	10.8%

(Contd...)

Table 2: (Contd...)

<i>Health professionals knowledge-related variables</i>	<i>Responses (n)</i>	<i>Percentage (%)</i>
In our Hospital ICU, there are indications for the use of a mini-tracheostomy		
Strongly agree	29	16.5%
Agree	20	11.4%
Neutral	88	50%
Disagree	27	15%
Strongly disagree	12	6.8%

Similarly, based on the above survey report, 65% of tracheostomies were performed in ICU and 35% of cases were done in the operation theater. In contrary to this report, our descriptive study showed that 70% of tracheostomy procedures were done in the operation theater, and 30% performed in the ICU.

Another study also showed that percutaneous procedures and surgical tracheostomy were the technique of the first choice in 62 and 38% of ICUs, respectively. Only in 7% of units were used late follow-up protocols, whereas, in our study, only 15% of patients performed under percutaneous technique. This significant variation with our study might be due to low levels of awareness and knowledge of health professionals regarding percutaneous tracheostomy. As we stated earlier regarding knowledge of health professionals on the practice of tracheostomy, 78 (44.31%) responded percutaneous technique is better for elective tracheostomy and 64 (36.36%) of

respondents answered surgical tracheostomy is a better choice for elective tracheostomy, whereas 30 (17%) responded as there is no difference between surgical and percutaneous tracheostomy procedures. Even though percutaneous tracheostomy is the best recommended and preferred procedure to minimize complications, inadequate understanding of health professions will be contributed to the underperformance of these procedures.

CONCLUSION

Percutaneous tracheostomy was under-practiced in Amhara regional CSHs. Based on our study result, we found that surgical tracheostomy was the commonest technique practiced currently in our setup. The majority of tracheostomy procedures were performed in the operation theater. The decision time to proceed with a tracheostomy was after 14 days of postintubation in most cases. The knowledge of health professionals, who were working in ICU, regarding tracheostomy, was poor. Local guidelines on the practice of tracheostomy were only available at two ICUs.

CLINICAL SIGNIFICANCE

This study is one of important areas in addressing peculiar gaps in the tracheostomy practice for mechanically ventilated patients in ICU, especially in low-income countries where tracheostomy-related complication is high. Knowing the practice and health professional's knowledge toward tracheostomy is among the most important area of ICU care in medicine and there is no previous published work within this regard in Ethiopia and in Africa.

RECOMMENDATION

Based on our study, we recommend that percutaneous tracheostomy should be practiced well to maximize patient outcomes and to facilitate recovery period. Based on recommendations of different kinds of literatures, tracheostomy procedures should be performed within 7 days of mechanical ventilation to fasten the weaning process. We also recommend having local guidelines and training on tracheostomy procedures to maximize the knowledge and understanding of health professions working in ICU.

LIMITATION OF THE STUDY

A further analytical study is needed to identify the contributing factors on the under the practice of tracheostomy in our study areas.

We also recommend for researchers to do it with better study design and at country level.

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