

# Anesthesia technician's knowledge of endotracheal tube suction in the intensive care unit

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**ABSTRACT Background:** Endotracheal tube suctioning is an essential component of airway management for patients on artificial ventilation. It is one of the most frequently performed invasive procedures in the Intensive Care Unit (ICU), aimed at maintaining airway patency, ensuring adequate oxygenation, mitigating the risk of ventilator-associated pneumonia (VAP), and preventing atelectasis and pulmonary consolidation. **Objective:** This study is to evaluate the understanding of anesthetic techniques related to endotracheal suctioning. **Methods:** A descriptive cross-sectional study approach was employed to elucidate the variables and their interrelationships in this research. **Result:** The findings indicated that the anesthesia technicians' knowledge of Endotracheal Tube Suction in the intensive care units was predominantly intermediate (52%), with a mean score of 11.76. **Conclusion:** This study indicates that, despite moderate expertise, the performance of anesthetic technicians is affected. Regarding the fact that the role of education throughout service has gained increased significance.

**KEYWORDS** anesthesia technician, endotracheal tube suction, intensive care unit

## 1. INTRODUCTION

Mechanical ventilation is an essential, life-preserving intervention for patients with critical diseases and respiratory conditions [1], [2]. This method entails potential repercussions and risks: bleeding, tracheal mucosal lesions, infections, atelectasis, cardiovascular disorders, hypoxemia, and elevated intracranial pressure [3]. Endotracheal intubation is essential for airway management in patients on mechanical ventilation, representing one of the most frequently performed invasive procedures in the Intensive Care Unit (ICU). It ensures airway patency, facilitates adequate oxygenation, mitigates the risk of ventilator-associated pneumonia (VAP), and prevents atelectasis and pulmonary consolidation [4]. The primary objective is to eliminate accumulated lung secretions to ensure airway patency, facilitate sufficient oxygenation, mitigate the risk of ventilator-associated pneumonia, and avert pulmonary consolidation and atelectasis [5].

Alternatively, there may be some practices that continue to be followed even when strong guidance clearly indicates either no benefit or actual harm. Invasive techniques like manual ventilation with a bag-valve-mask and the instillation of normal saline have demonstrated no benefits for patients during suctioning; however, these practices persist in certain units [6]. A Cochrane review regarding the frequency of endotracheal suctioning (ETS) in neonates identified only one article, which was outdated and consequently did not provide recommendations on suctioning frequency. However, their re-

view concurs with the American Association for Respiratory Care Practice Guidelines, stating that ETS suctioning should only be performed in the presence of secretions, thereby indicating that proficiency in patient assessment is essential [7].

In this context, endotracheal suctioning is one of the most critical acts in anesthesia technician care, aimed at removing secretions and so ensuring the maintenance of airway patency, as well as enhancing ventilation and oxygenation. This research aims to evaluate the understanding of anesthetic techniques related to endotracheal suctioning.

## 2. METHODS

### 2.1. Design of the study

A descriptive cross-sectional study design was used to describe the variables and the relationships that occur among them in this study.

### 2.2. Setting of the study

The study has been conducted in Iraq Karbala city health directorate Al Hussein Medical City.

### 2.3. Sample and sampling

Nonprobability sampling was used in this study and sample were collected from the staff of Anesthetic Technicians working in the ICU at AL Karbala city.

### 2.4. The study instruments

A questionnaire consisting of two parts: Demographic data (7 items); anesthesia technician's knowledge of ETS in the intensive care unit (19 question). These items were used to fulfill the study question related to the study aiming.

### 2.5. Statistical data analysis

Several statistical measures were used by using Statistical Package of Social Sciences (SPSS) version 26, in order to analyze and evaluate the results of the study.

## 3. RESULTS

In Table 1 the results showed the age for 25 participants at majority (80%) less than 30 years with mean 26.92 years. According to the gender at majority (76%) were male and the most (64%) from city area. Regarding the level of education, the most (72%) of participants completed institute and the most (60%) were single. The results also shown the majority (84%) in the morning and the all were governmental study.

**TABLE 1. Demographics qualitative characteristic for the participants**

Demographic characteristic	Subgroup	F	%
Age	Less than 30 years	20	80.0
	30-40 years	4	16.0
	41-50 years	1	4.0
	Total	25	100.0
Mean $\pm$ SD 26.92 $\pm$ 6.429 Min- Max 21- 50 Years			
Gender	Male	19	76.0
	Female	6	24.0
	Total	25	100.0
Marital status	Single	15	60.0
	Married	10	40.0
	Total	25	100.0
Residency	Rural	9	36.0
	City	16	64.0
	Total	25	100.0
Education	Institute	18	72.0
	College	7	28.0
	Total	25	100.0
Time	Morning	21	84.0
	Evening	4	16.0
	Total	25	100.0
Study	Governmental	25	100.0
	Private	0	0
	Total	25	100.0

F= frequency, %= percentage,  
SD= standard division, Min= minimum and Max= maximum

In Table 2 the result showed the anesthesia technician's knowledge of ETS in the intensive care units were good with mean .62 (Min- Max 0-1). And the high percentage in item number 15 with mean 1.0 and the less percentage in item number 17 with mean 0.32.

In Table 3 the result showed the level of anesthesia technician's knowledge of ETS in the intensive care units at most were moderate (52%) with mean 11.76.

## 4. DISCUSSION

The results indicated a non-significant statistical link between anesthetic technicians' knowledge of ETS in intensive care

**TABLE 2. Assess the anesthesia technician's knowledge of ETS in the intensive care unite**

Items	M	S.D	Eva.
1. How frequently should the endotracheal /tracheal suctioning be done?	.84	.374	G
2. Which is the best method of suctioning?	.44	.507	M
3. While giving nasotracheal suctioning to an adult patient, suction catheters should be inserted up to?	.72	.458	G
4. Which of the following is true regarding endotracheal suctioning?	.28	.458	P
5. Maximum time limit for an endotracheal suctioning is?	.56	.507	M
6. Which is the most appropriate position for giving endotracheal suctioning?	.72	.458	G
7. Successful suctioning is confirmed by which method?	.80	.408	G
8. which of the nerve is stimulated during endotracheal suctioning?	.84	.374	G
9. which will be the possible complication of suctioning due to irritation of carina	.72	.458	G
10. what is the recommended suction pressure for endotracheal suctioning in adults?	.36	.490	M
11. How frequently should the ET suction catheter be changed?	.40	.500	M
12. Which one of the following complication can arise due to absence of hyperventilation before giving suctioning?	.48	.510	M
13. Sodium bicarbonate should not be instilled through the ET tube why?	.40	.500	M
14. You are being asked to do an endotracheal suctioning for a patient with ET tube size 8mm. Appropriate size of suction catheter you will choose for this patient is	.52	.510	M
15. Prevention of nosocomial infections	1.00	.000	G
16. Effect of Preoxygenation in ETS	.84	.374	G
17. Contraindications for ETS	.32	.476	P
18. Normal Saline instillation during ETS	.80	.408	G
19. the reason behind discontinuation of procedure.	.72	.458	G
Overall	.62	.164	M

M=mean, SD= standard deviation, Eva. / P=poor (0-0.33), M=moderate (0.34-0.66) and G=good (0.67-1)

units and their age, with  $P > 0.05$ . The results indicated substantial statistical differences in the knowledge of anesthesia technicians on ETS in intensive care units and their demographics, with  $P < 0.05$ .

This data is corroborated by another study, which revealed that about two-thirds of the patients were male, with ages

**TABLE 3. The levels of anesthesia technician’s knowledge of ETS in the intensive care units**

	Range	F	%	Mean	SD
Poor	0-6	1	4.0	11.76	3.113
Moderate	7-12	13	52.0		
Good	13-19	11	44.0		
Total 0-19		25	100		

F= frequency, %=percentage

**TABLE 4. The relationship between anesthesia technician’s knowledge of ETS in the intensive care units and their demographics characteristic**

Demographic characteristic	Subgroup	Mean	SD	Analysis	P. value
Age	Less than 30 years	.62	.169	Cc=.086	.681
	30-40 years	.59	.179		
	41-50 years	.63	.182		
Gender	Male	.60	.170	t=-.1.125-	.272
	Female	.68	.133		
Marital status	Single	.61	.175	t=-.309-	.760
	Married	.63	.153		
Residency	Rural	.54	.162	t=-1.959-	.062
	City	.66	.151		
Education	Institute	.49	.162	t=1.201	.049
	College	.66	.163		
Time	Morning	.62	.164	t=.351	.729
	Evening	.59	.184		

P=probability value, NS: Non-Significant at P >0.05, S: Significant at P <0.05, HS: Highly Significant at P <0.01.

ranging from 25 to 34 years (93%), and an average age of 29±2.8. This conclusion can be corroborated by an additional study. Of the 14 individuals, 51.9% were male. The mean age was 40.6 years ± 7 (ranging from 24 to 55) [8].

The average age of patients was 30.7 years, with a range from 18 to 45 years old. The results obtained were consistent with those reported by other researchers, all of whom possessed a Bachelor of Science degree as their level of education [9].

The Knowledge Scores of Anesthesia Technicians in Intensive Care Units (n=25) regarding Endotracheal Suctioning for Adult Patients in Hila Hospitals. The study aims to evaluate the knowledge of intensive care unit anesthesia technicians regarding endotracheal tube suctioning for adult patients (Table 2). The current study calculated the average scores of anesthesia technicians in both knowledge and performance. The level of knowledge was categorized into three tiers: poor (0-0.33), moderate (0.34-0.66), and good (0.67-1). Table 2 presents the results indicating that the anesthesia technicians’ knowledge of ETS in the intensive care units was good, with a mean score of 0.62 (Min-Max 0-1). The high percentage in item number 15, with a mean of 1.0, contrasts with the lower percentage in item number 17, which has a mean of 0.32.

This result aligns with findings from another researcher, who indicated that 66.6% of ICU anesthesia technicians frequently perform endotracheal/tracheal suctioning as needed. A majority, 100%, indicated that the closed method is preferred for endotracheal suctioning (ETS). Additionally, 43.33% of anesthesia technicians reported that for nasotracheal suctioning in adult patients, the suction catheter should be inserted 16-20 cm. Furthermore, 100% agreed that the endotracheal suctioning tube should be removed upon catheter

withdrawal. The maximum time limit for endotracheal suctioning was reported by 93.33% to be 10-15 seconds, while 63.33% identified the semi-Fowler’s position as the most appropriate for administering endotracheal suctioning. Lastly, 96.66% stated that the ET suction catheter should be changed after suctioning [10].

Regarding anesthesia technicians’ knowledge regarding complications associated with endotracheal suctioning. The findings indicated that only 36% of anesthesia technicians recognized that the vagus nerve is stimulated during endotracheal suctioning. Additionally, 42% acknowledged that paroxysmal cough can occur due to irritation of the carina, while 74% reported that lung tissue damage may result from the instillation of sodium bicarbonate through the endotracheal tube.

This result aligns with other research indicating that 73.33% of participants report stimulation of the vagus nerve during endotracheal suctioning. Additionally, 80% of anesthesia technicians suggest that a possible complication of suctioning is irritation of the carina, while 66.6% indicate lung tissue damage due to sodium bicarbonate instilled through the endotracheal tube [11].

The knowledge of anesthesia technicians concerning the prevention of nosocomial infections. The study results indicate that 46% of anesthesia technicians adhere to handwashing and maintain aseptic techniques to prevent nosocomial infections. The study also assessed knowledge regarding the recommended suction pressure for adult patients, revealing that only 26% of anesthesia technicians utilize a pressure of 80-120 mmHg. Additionally, it evaluated the technicians’ understanding of catheter sizes for suctioning. It was found that 64% of anesthesia technicians utilize a size smaller than the internal diameter of the tracheal tube.

The study’s findings are consistent with those of previous researchers, who reported that 45.2% of them utilize 80-120 mmHg pressure. It was shown that more than half of anesthesia technicians (64.3%) utilize a size smaller than the internal diameter of the tracheal tube. Correct tube size reduces patient suffering and tracheal mucosa damage [12], [13].

The assessment of total knowledge was conducted using a grading scale. Table 3 presents the findings regarding the knowledge of anesthesia technicians on ETS in intensive care units, indicating that the majority exhibited a moderate level of understanding (52%), with a mean score of 11.76. Knowledge across five areas revealed varying results based on professional classification. The results aligned with findings from other researchers who assessed the knowledge and practices of anesthesia technicians before and after training, as well as the development of protocols for open and closed system suctioning methods in patients with endotracheal tubes (ETTs). This study demonstrated a significant increase in knowledge and practice scores following implementation [14]. This finding aligns with results obtained by other researchers, who indicated that professionals’ knowledge was rated as fair (73.2% correct). However, it is concerning that

five areas were deemed poor, with varying results across professional categories.<sup>8</sup> The results of this study contradict those of another researcher who stated that. The findings indicated a moderate level of knowledge across various subjects. 14 This study indicates that approximately 50% of anesthesia technicians achieved above-average knowledge scores [15].

The statistical correlation between anesthesia technicians' knowledge of ETS in intensive care units and their age was non-significant ( $P > 0.05$ ). The results indicated significant statistical differences between the knowledge of anesthesia technicians regarding ETS in intensive care units and their demographic factors ( $P < 0.05$ ). No statistically significant differences were observed when comparing the results, both in practice and knowledge, with years of experience in the ICU. There is a notable difference in the mean knowledge between the two age groups; however, the observed increase in mean knowledge was not statistically significant ( $P$  value 0.18). Additionally, there was no statistically significant difference in the mean practice score of both groups ( $P$  value 0.27) [16], [17].

## 5. CONCLUSION

This study illustrates that, even possessing moderate expertise, the performance of anesthetic technicians is affected. Given the increasing significance of education in service, anesthesia technicians are required to participate in educational courses. It appears that theoretical education alone positively influences their performance; however, equal emphasis must be placed on practical education and other vocational and managerial considerations. Anesthesia technicians must be equipped with suitable gear for the proper execution of endotracheal suctioning.

## 6. RECOMMENDATIONS

- An educational program for anesthesia technicians in the critical care unit aimed at enhancing understanding and practices about endotracheal tube suctioning to mitigate complications during the operation.

- The necessity to implement and regularly update practice guidelines and educational programs at all hospitals in Iraq.

The identical study will be conducted in additional critical care units, expanding the sample size at several teaching hospitals in Iraq.

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