

**PREVALENCE AND RISK FACTORS OF COMPLICATION OF ENDOTRACHEAL
EXTUBATION IN TEACHING HOSPITALS AFFILIATED WITH JAHROM
UNIVERSITY OF MEDICAL SCIENCE**

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ABSTRACT

Endotracheal intubation is to maintain a safe open airway to prevent pulmonary aspiration by administrating general anesthesia. Endotracheal tube, as a foreign body, can stimulate the patients' airway during the emergence from general anesthesia and cause various reactions and complications immediately or within a multi-day delay.

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The present study intended to determine the prevalence and associated risk factors of the complications of endotracheal extubation (removal of endotracheal tube / ETT) within 24 hrs. since the surgery. To this end, a descriptive research was conducted on 200 adult candidates for elective and emergency surgery of endotracheal intubation by administrating general anesthesia. Data about the intended associated risk factors and complications were respectively collected in operating room (OR) and within 24 hrs. since surgery and were recorded in the questionnaire. The results indicated that the prevalent complications were sore throat (%21), cough (%12.5) and hoarseness (%15.5). There was not any case of dysphagia and bloody sputum (blood-streaked expectorant). Also, there was a significant relationship between sore throat and the type of surgery (P 0.001). On the other hand, there was not any statistically significant relationship between sore throat and other associated risk factors (sex, age, weight, type of surgery and size of endotracheal tube). Likewise, not any significant relationship was observed between cough, hoarseness and the intended risk factors. To conclude, the present study found that the type of surgery has a significant effect on the incidence of sore throat within 24 hrs. since the surgical operation; thus, raising awareness of these risk factors and taking proper actions, particularly during intubation, can reduce the incidence of complications, in particular sore throat, and improve patients' satisfaction.

Keywords: General Anesthesia; Intubation; Complications.

1. INTRODUCTION

Airway management is one of the most important basic principles on the expertise of anesthetists, critical care and medical staffs. The procedure of endotracheal intubation is fast, simple, safe without any surgical intervention that meets all the purposes of airway management. Opening and airway, protecting the lungs from aspiration of gastric contents and connecting the ventilator to the patient are all administered by endotracheal intubation [1]. Although considerable attention has been given to endotracheal intubation especially when the airway is aspirated, the procedure of extubation has not been taken into account [2]. However, it is

necessary for anesthetists to raise their awareness of the complications of extubation and associated risk factors including high cuff pressure [3], difficult intubation [4] and intubation time [5] to manage effective strategies in order to prevent and inhibit the complications.

Hypertension, tachycardia, ischemic heart tissue (ischemia) and cardiac arrhythmias as well as physical injuries to the soft tissues of mouth, teeth and tongue are amongst the probable complications of laryngoscopy due to the reflex sympathetic stimulation and catecholamine release. Moreover, the probable complications, like laryngospasm, which occur during endotracheal intubation due to the insufficient level of anesthesia, include tracheal perforation, bronchus and esophagus during difficult intubation as well as aspiration of gastric contents. Besides, some complications are associated with the postoperative extubation (removal of endotracheal tube) including airway obstruction, laryngospasm, aspiration of gastric contents, sore throat, hoarseness, cough, laryngeal edema, bloody sputum (blood-streaked expectorant) and dysphagia [6 & 7]. Stridor, sore throat and cough can also associate with the cuff pressure of endotracheal tube [8]. Tracheal wall pressure depends on the size, diameter and cuff pressure of tracheal tube. It is possible that cuff pressure plays a crucial role in the incidence of complications [9].

Although considerable attention has been given to endotracheal intubation especially when the airway is aspirated, the procedure of extubation has not been substantially taken into account [2]. Anesthetists are aware of the fact that the short period after extubation can be troublesome involving laryngospasm, aspiration, the absence of full open airway, insufficient pulmonary ventilation and severe coughs. Therefore, it is necessary to conduct further investigations into identifying post-extubation aggravating and mitigating risk factors in adults during and after surgery for timely prevention and treatment. Hence, the present study intended to investigate the prevalence and associated risk factors of post-extubation complications in adults in teaching hospitals affiliated with Jahrom University of medical sciences.

2. RESULTS

Sample population included 200 participants amongst which 92 (%46) and 108 (%54) patients were respectively male and female who underwent Appendectomy, Cholecystectomy, Rhinoplasty, Septoplasty, Discectomy and Functional Endoscopic Sinus Surgery (FESS). Table 1 and 2 presents data about the frequency, prevalence and associated risk factors of post-extubation complications within 24 after the surgery.

Table 1. The frequency and percentage of participants' demographic variables

	Variable	Number	Percentage (%)
Sex	Male	92	46
	Female	108	54
Weight	Under 70 kg	95	47.5
	70-90 kg	96	48
	Above 90 kg	9	4.5
Age	Under 30 years	75	37.5
	30-50 years	79	39.5
	Above 50 years	46	23
Type of Surgery	Appendectomy	59	29.5
	Cholecystectomy	55	27.5
	Rhinoplasty	30	15
	Septoplasty	15	7.5
	Discectomy	27	14
	FESS	13	6.5
Size of ETT	7	29	14.5
	7.5	109	54.5
	8	62	31

Table 2. The prevalence of post-extubation (removal of ETT) complications within 24 hrs. after surgery.

Complications	Yes		No	
	Number	Percentage (%)	Number	Percentage (%)
Sore Throat	42	21.0	158	79.0
Cough	25	12.5	175	87.5
Hoarseness	31	15.5	169	84.5
Dysphagia	0	0	200	100.0
Bloody Sputum	0	0	200	100.0

Table 3 below presents the relationship between the dependent and independent variable according to the results of Chi-square test.

In terms of sex, age and weight of patients, there was not any statistically significant relationship between the sex and complication including cough (P: 0.520), sore throat (P: 0.813) and hoarseness (P: 0.722). Furthermore, there was not any statistically significant between the age and complications including sore throat (P: 0.881), hoarseness (P: 0.235) and cough (P: 0.157). Besides, there was not any statistically significant relationship between the weight and complications including cough (P: 0.660), sore throat (P: 0.493) and hoarseness (P: 0.009).

In terms of the type of surgery, there was not any statistically significant relationship between the type of surgery and complication including cough (P: 0.917) and hoarseness (P: 0.086). On the contrary, there was a statistically significant relationship between the type of surgery and sore throat (P: 0.000).

In terms of the size of ETT, Chi-square results showed that there was not any statistically significant relationship between the size of ETT and complications including cough (P: 0.606), sore throat (P: 0.032) and hoarseness (P: 0.356).

In terms of duration of intubation, there was not any statistically significant relationship between the duration of intubation and cough (P: 0.109) and hoarseness (P: 0.009); whereas, it had a statistically significant relationship with sore throat (P: 0.000).

Table 3: The relationship between the intended dependent and independent variables

Variable		Cough		Sore Throat		Hoarseness	
		Number	Percentage (%)	Number	Percentage (%)	Number	Percentage (%)
Sex	Male	10	10/9	20	21.7	15	16.3
	Female	15	13.9	22	20.4	16	14.8
	P-value	0.520		0.813		0.772	
Age (Years)	19-29	8	10.7	15	20.0	14	18.7
	30-50	14	17.7	18	22.8	8	10.1
	Above 50	3	6.5	9	19.8	9	19.6
	P-value	0.157		0.881		0.235	
Weight (kg)	Under 70	14	14.8	23	24.2	18	19
	70-90	10	10.4	18	18.8	9	9.4
	Above 90	1	11.2	1	11.2	4	44.4
	P-value	0.660		0.493		0.009	
Type of Surgery	Appendectomy	7	11.9	3	5.1	7	11.9
	Cholecystectomy	5	9.1	6	10.9	4	7.3
	Rhinoplasty	4	13.3	13	43.3	9	30
	Septoplasty	2	13.3	2	13.3	2	13.3
	Discectomy	2	15.4	4	30.8	3	23.1
	FESS	5	17.9	14	50	6	21.4
	P-value	0.917		0.000		0.086	
Size of	7	2	6.9	5	17.2	4	13.8

ETT	7.5	15	13.8	17	15.6	14	12.8
	8	8	12.9	20	32.3	13	21
	P-value		0.606		0.032		0.356
Duration of Intubation (Hours)	Less than 1	5	6.8	7	9.5	6	8.1
	1-2	12	13	15	16.3	14	15.2
	2-3	7	23.3	17	56.7	9	30
	3-4	1	25	3	75	2	50
P-value		0.109		0.000		0.009	

3. DISCUSSION

The current study aimed at investigating the prevalence of post-extubation complications within 24 hrs. After the surgery as well as identifying the aggravating and mitigating risk factors associated with the complications in patients undergoing intubation by administering general anesthesia. The results indicated that the overall prevalence of sore throat, cough, hoarseness was respectively 21%, 12.5% and 15.5%. There was not any case of Dysphagia and Bloody Sputum (blood-streaked expectorant).

The results of the present study are in line with the findings of Maruyama et al. (2004), Aliya et al. (2007) who respectively reported the prevalence of sore throat by 25% and 28%, and with the findings of Tayebi et al. (2005) who reported that cough was prevalent by %13.95 (10 – 12).

Conversely, according to Jones et al. (1968), the prevalence of sore throat and hoarseness was respectively 56.1% and 4.4% [13]. Higgins et al. (2002) sore throat was reported to be prevalent by 45.4% [14]. In the study of Oczenski et al., the prevalence of sore throat and hoarseness was respectively 16% and 44% in ETT group [15]. They found that age and sex did not have any significant effect on sore throat and cough.

According to both Aliya et al. and Higgins et al., sore throat was more prevalent amongst elders and women who were in contrast to the findings of the present study [12,14]. Maruyama et al. found that sore throat and hoarseness were more prevalent amongst women [10].

The present study observed that Discectomy and Rhinoplasty were highly associated with sore throat amongst all types of surgeries. In this regard, Jones et al. reported that the incidence of sore throat was more prevalent in prone position, during surgery, and in ENT surgeries [13]. Aliya et al. also found that the lying position of patients during surgery is closely associated with the prevalence of sore throat, which is consistent with the findings of the present research [12].

To elaborate more, it can be explicated that since discectomy requires prone position, that patients incur sore throat is more likely due fastening ETT to patients in supine position and rotating them to prone position without proper rotation of ETT [13]. Furthermore, the prevalence of sore throat in Rhinoplasty may contribute to the anatomical location of surgery and movement of head during the surgery [13]. Besides, the type of surgery has a significant relationship with cough and hoarseness for which not any related studies have been found.

According to the present study, the size of ETT did not have any significant effect on sore throat, hoarseness and cough. Likewise, Jaenson et al. found that there was not any significant relationship between two surgical groups with different ETT size in terms of the prevalence of sore throat and hoarseness withn 24 hrs. since surgery [16]. In this regard, the findings of Jones G. O. M. et al. are consistent with the results of the present study [13].

On the contrary, XU Y. J et al. found that using smaller ETT size reduces the prevalence and severity of sore throat due to its less contact with tracheal mucosa [13,17].

The present study also found that there was a significant relationship between duration of intubation and sore throat (P: 0.000); whereas, it did not show any significant relationship with hoarseness and cough. In contrast, Aghadavoudi et al. found that there was not any significant relationship between duration of intubation and surgical operation and sore throat [18,19].

4. MATERIALS AND METHODS

The present study is a descriptive research. Research population included 200 patients, aged above 18, who were candidate for either elective or emergency intubation surgery through administrating general anesthesia in the hospitals affiliated with Jahrom University of medical

sciences during 2013-2015. Patients with congenital disorders in upper airway anatomy and those who were reluctant to participate in the study were excluded. The present study instigated after the Research Council and Ethic Committee of Jahrom University of medical sciences granted permission.

First, patients, conformed to inclusion criteria, were provided with necessary information and participated in the study after consent was reached. The participant patients underwent a physical examination (preoperative visit) by the surgeon and their medical history, including previous medication, smoking, drug and alcohol use, allergic diseases, asthma, cold and ASA classification, was recorded.

Once the patient lay in the operating table, the vital signs were monitored and the patient was injected with anesthetic pre-medication (Midazolam 0.2 mg/kg & Fentanyl 2 mg/kg), anesthetic induction (Sodium Thiopental 5-6 mg/kg), muscle relaxant (Atracurium 0.5 mg/kg, Acetylcholine or Pancuronium/Pavulon) through a proper vein. The procedure of endotracheal intubation was performed by an experienced and trained expert using a laryngoscope after a five-minute pre-oxygenation and once the muscle relaxant acted completely. The sizes of endotracheal tubes were 7, 7.5 and 8. After intubation, the endotracheal tube cuff (balloon cuff) was filled with air syringe through leak-off (eliminating air leakage around the tube) to cut off the noise of airflow; then, the tubes were fastened to a convenient location for the ventilation of both lungs (symmetrical). Next, the ventilator was connected to the patient and anesthesia was maintained by the continuance of isoflurane, oxygen and nitrous oxide. About 5 to 10 minutes before the end of surgery, the continuance of isoflurane was ceased; the relaxants were reversed by atropine and neostigmine after the surgery. When the patient could open his eyes in response to verbal commands, the endotracheal tube was removed from the patient (extubation fulfilled). Afterwards, the problems during the removal of endotracheal tube (extubation) and post-extubation complications (sore throat, hoarseness, dysphagia and bloody sputum / blood-streaked expectorant) were examined. Subsequently, the information including age, weight, sex, type of surgery, size of endotracheal tube, intubation duration was recoded. Finally, patients were

questioned whether they had had complications such as cough, sore throat, hoarseness, bloody sputum, dysphagia within 24 hrs. since extubation; their responses were recorded in the questionnaire.

Data were analyzed using SPSS21 descriptively. Furthermore, Chi-square test was used to determine the associated the risk factors.

5. CONCLUSION

To conclude, the present study found that the type of surgery has a significant effect on the incidence of sore throat within 24 hrs. since the surgical operation; thus, raising awareness of these risk factors and taking proper actions, particularly during intubation, can reduce the incidence of complications, in particular sore throat, and improve patients' satisfaction.

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