

Factors influencing Postoperative Sore Throat in Patients Undergoing Elective Surgeries under General Anaesthesia

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KEYWORDS

ABSTRACT

Postoperative sore throat;
Endotracheal intubation;
Endotracheal tube cuff pressure measurement;
General anesthesia.

Background: Sore throat (POST) is a common complication following general anesthesia, causing significant discomfort and dissatisfaction among patients. This study aimed to evaluate the incidence of POST and its potential correlations with various factors in patients undergoing elective surgeries under general anesthesia.

Materials and Methods: A prospective, observational study was carried out on 60 patients (27 males, 33 females) aged 18-65 years, ASA I-III posted for elective surgeries under general anesthesia. The incidence and severity of POST along with other complications were observed at 1, 6 and 12 hours post-operatively. We also assessed for any correlation of POST with age, sex, number of intubation attempts, changes in endotracheal tube (ET) cuff pressure and duration of surgery.

Results: The overall incidence of POST was 66.67%. The incidence was observed highest in 31-40 years age group, with females being more susceptible. Surgeries lasting ≥ 120 minutes had high incidence of POST (60%). Changes in ET cuff pressure were required in 86.67% of patients. We had reported other complications like cough (3.33%), discomfort (16.67%), and hoarseness (5.00%). No significant association was found between the grade of sore throat and the post-operative interval ($\chi^2 = 3.096$, $p = 0.796$).

Conclusion: POST is a frequent complication following general anesthesia. Age, sex, duration of surgery, intubation attempts and changes in endotracheal tube cuff pressure are being significant influencing factors. Regular monitoring, adjustment of cuff pressure and implementation of preventive strategies may help to lower the incidence and severity of POST and thus it helps in improving patient outcomes and satisfaction.

Introduction:

In day to day anesthesia practice, 40% of patients receive GA. Endotracheal intubation is must to secure airway and facilitate ventilation during GA. After receiving general anesthesia, postoperative sore throat (POST) is a known complication with an incidence ranging from 14.4% to 50%.¹ Although POST is generally considered a minor complication, it can cause significant discomfort and dissatisfaction to patients, potentially leading to prolonged hospital stays and increased healthcare costs. Various factors have been identified as potential contributors to the development of POST, including patient characteristics, surgical procedures and anesthetic management.

Endotracheal tube can cause mucosal damage, inflammation and edema in the larynx and trachea, leading to sore throat, hoarseness and dysphagia.² Duration of intubation, size of the endotracheal tube, number of intubation attempts and endotracheal tube cuff pressure has been associated with an increased risk of POST. Endotracheal cuff pressure manometer (Pylant monitor) is used to keep pressure between 20-30 cm H₂O. Overinflation of the cuff can lead to mucosal ischemia and damage, while underinflation may result in inadequate seal and aspiration. Maintaining cuff pressure within an optimal range typically between 20-30 cm H₂O has been shown to lower the incidence of POST.^{3,4} In addition to intubation-related factors like patient's age, gender, type of surgery (head and neck surgery), duration of surgery which require prolonged intubation, patient's positioning during surgery (Prone or Trendelenburg) might increase the risk of developing POST due to potential risk of increased pressure on the larynx and trachea.⁵

We aimed to evaluate the factors inducing postoperative sore throat in patients undergoing elective surgeries under general anesthesia. The primary objective of this study was to investigate the incidence of postoperative sore throat (POST). The secondary objectives were to evaluate the association between POST and gender, age, number of intubation attempts, duration of surgery, patient positioning during surgery and changes in endotracheal tube cuff pressure.

Materials and Methods:

A prospective observational study was carried out at P.D.U. Medical College and Hospital, Rajkot, from January 2018 to December 2020 after approval from the Institute Ethical Committee (PDU/MCR/IEC/23267/2017, dated 14/12/2017) and written informed consent was taken. A total of 60 patients, aged 18 to 65 years of either sex, American Society of Anesthesiologists (ASA) grade I, II or III posted for elective surgeries under general anesthesia were included in this study. Patients undergoing head and neck surgeries, those with anticipated difficult intubation, a history of chronic obstructive pulmonary disease, smoking, or steroid use, and those who decline to participate were excluded from the study.

All patients received Inj. Glycopyrrolate 4µg/kg, Inj. Ranitidine 1 mg/kg, Inj. Ondansetron 80 µg/kg, and Inj. Diclofenac Sodium 1.5 mg/kg intravenously as premedication 10 min before induction. After pre-oxygenation with 100% oxygen for 3 minutes, general anesthesia was induced with Inj. Thiopentone Sodium 6 mg/kg IV and Inj. Succinylcholine 2 mg/kg IV. Intubation was done with cuffed portex endotracheal tubes (size 8.0F for males and 7.0F for females) after the cessation of fasciculations. Anesthesia was maintained with nitrous oxide and oxygen (2:1), sevoflurane, and intermittent doses of Inj. Atracurium, along with intravenous fluids. All patients were extubated with neuromuscular reversal agent after adequate tone power and respiration.

Patients were monitored for heart rate, non-invasive blood pressure, oxygen saturation, and ECG throughout the surgery and for 2 hours postoperatively. The endotracheal tube cuff was inflated with air and the cuff pressure was maintained at 25 mmHg throughout the surgery using a Pylant monitor and its measurement was taken every 30 minutes till extubation. Any changes in cuff pressure were noted and adjusted accordingly (inflation or deflation). The incidence and severity of POST was assessed at 1 hour, 6 hours and 12 hours postoperatively by asking the patients and was noted according the grading system as mentioned: 0= No sore throat, 1 = Mild sore throat, 2 = Moderate sore throat, 3 = Severe sore throat. Hoarseness, discomfort, cough, and dysphagia were also assessed at 1 hour, 6 hours, and 12 hours postoperatively. Patients with sore throat within 24 hours postoperatively were reassured and advised for hot water gargles, plenty of fluids, nebulization, lozenges and voice rest. If sore throat remained persistent beyond 24 hours, patients were referred to an ENT specialist for further management. However, no patients required ENT opinion and this complaint resolved by above modalities.

Statistical Analysis

Data were collected, organized and then analysed using Statistical Package for the Social Sciences (SPSS) software statistics version 22.0 (IBM corp., Armonk, NY, USA). Continuous parameters were demonstrated as mean $\pm$ SD while categorical parameters were demonstrated as numbers and percentage. Unpaired student's t-test was used for continuous variables and Chi-square test was used to compare categorical variables. To compare the difference in the incidence of POST between groups, Chi square test was used. P value < 0.05 was considered statistically significant.

Results:

As mentioned in Figure 1, we examined 68 patients for eligibility. Out of this, 8 participants were non-randomized as they either did not fulfil all eligibility criteria or denied to consent. All 60 patients enrolled for the research study, completed the study and the results were analysed. The study was performed at P.D.U. Medical College, Rajkot from January 2018 to December 2020.

A total 60 patients were entailed in the study, with 27 (45%) males and 33 (55%) females. We found incidence of post operative sore throat (POST) in 66.67% of patients, from which 12 (20%) male and 28 (46.67%) females experienced sore throat (Table 1). The distribution of sore throat according to age and sex is presented in Table 2. The incidence of POST was higher in the age group of 31-40 years, with 5 males (8.3%) and 9 females (15%). The incidence was decreased with increasing age (Table 2). Multiple intubation attempts were undergone in 25 patients (41.5%) complained of POST as compared to 14 patients (23.5%) with single attempt (Table 3). The occurrence of POST at various post-operative intervals is shown in Table 4. At 1 hour post-operatively, 15(25%) patients had mild sore throat (Grade I), 10(16%) had moderate sore throat (Grade II), and 15(25%) had severe sore throat (Grade III). The incidence of sore throat decreased over time, with 16(26%) patients reporting mild sore throat, 8(13%) reporting moderate sore throat, and 12(20%) reporting severe sore throat at 6 hours post-operatively. At 12 hours post-operatively, 12(20%) patients had mild sore throat, 6(10%) had moderate sore throat and 8 (13%) had severe sore throat. We again assessed patients at 24 hour and no patients complained of sore throat as we advised patients to do hot water gargles, nebulization, lozenges and voice rest. The Chi-square test revealed no statistical significant association between the grade of sore throat and the post-operative interval ($\chi^2 = 3.096$, $p = 0.796$).

Figure 2 presents the incidence of POST according to the duration of surgeries. In surgeries lasting 45-60 minutes, 5(8.3%) patients experienced POST, while 3(5%) did not. Surgeries lasting 60-90 minutes, 10(16%) patients had POST and 2(3.3%) did not. In surgeries lasting 90-120 minutes, 5(8.3%) patients experienced POST and 5(8.3%) did not. For surgeries lasting ≥ 120 minutes, 15(25%) patients had POST and 10(16%) did not.

The alteration of cuff pressure at different intervals from intubation is shown in figure 3. ET tube cuff pressure was observed at every 30 min after intubation and following changes in cuff pressure were noted in 17 patients at 30 minutes, 21 patients at 60 minutes, 12 patients at 90 minutes, and 15 patients at 120 minutes post-intubation.

Figure 4 indicates number of times, change in cuff pressure were made during surgery. No changes were required in 8 patients (13.33%), while 18 patients (30.00%) required one change, 13 patients (21.67%) required two changes, 11 patients (18.33%) required three changes, 6 patients (10.00%) required four changes, 3 patients (5.00%) required five changes, and 1 patient (1.67%) required six changes in cuff pressure.

The occurrence of post-operative complications other than sore throat is shown in Table 5. Cough was reported by 2 patients (3.33%), discomfort by 10 patients (16.67%), and hoarseness by 3 patients (5.00%). No patients experienced dysphagia post-operatively.

The results indicate that POST is most common adverse event with varying incidence rates across different age groups and durations of surgery after general anaesthesia. The incidence of POST decreased over time, suggesting that it is a self-limiting condition. Changes in endotracheal tube cuff pressure were frequently needed throughout surgery, highlighting the importance of regular monitoring and adjustment to minimize the risk of POST. Other post-operative complications, such as cough, discomfort, and hoarseness, were also observed in a small percentage of patients.

Table 1: Incidence of POST according to sex

Gender	Total no. of patients	No. of patient with Sore throat
Male	27 (45%)	12 (20%)
Female	33 (55%)	28 (46.67%)
Total	60	40 (66.67%)

Table 2: Incidence of POST according to age and sex

Age group (in years)	Male Yes	Male No	Female Yes	Female No	Total
18 – 30	2	2	4	2	10
31 – 40	5	7	9	1	22
41 – 50	1	1	7	2	11
51 – 65	4	5	8	0	17
Total	12	15	28	5	60

Table 3: Incidence of POST with numbers of intubation attempts

No. of Intubation attempts	Patient with Sore throat	
	Yes	No
Single	14(23%)	15(25%)
Multiple	25(41%)	6(10%)
Total	39(60%)	21(35%)

Table 4: Occurrence of sore throat after various postoperative intervals

Grade of Sore throat	At 1 hour	At 6 hours	At 12 hours	Chi-square (χ^2) Test ^a	p-value ^b
0 (No sore throat)	20(33%)	24(40%)	34(56%)	3.096	0.796
I (Mild sore throat)	15(25%)	16(26%)	12(20%)		
II (Moderate sore throat)	10(16%)	8(13%)	6(10%)		
III (Severe sore throat)	15(25%)	12(20%)	8(13%)		

a - Chi-square test

b - P < 0.05 was considered significant

Table 5: Post-Operative complications

Complaints	No. of patients (%)
Cough	2 (3.33%)
Discomfort	10 (16.67%)
Hoarseness	3 (5 %)
Dysphagia	0

Figure 1: Flow Chart

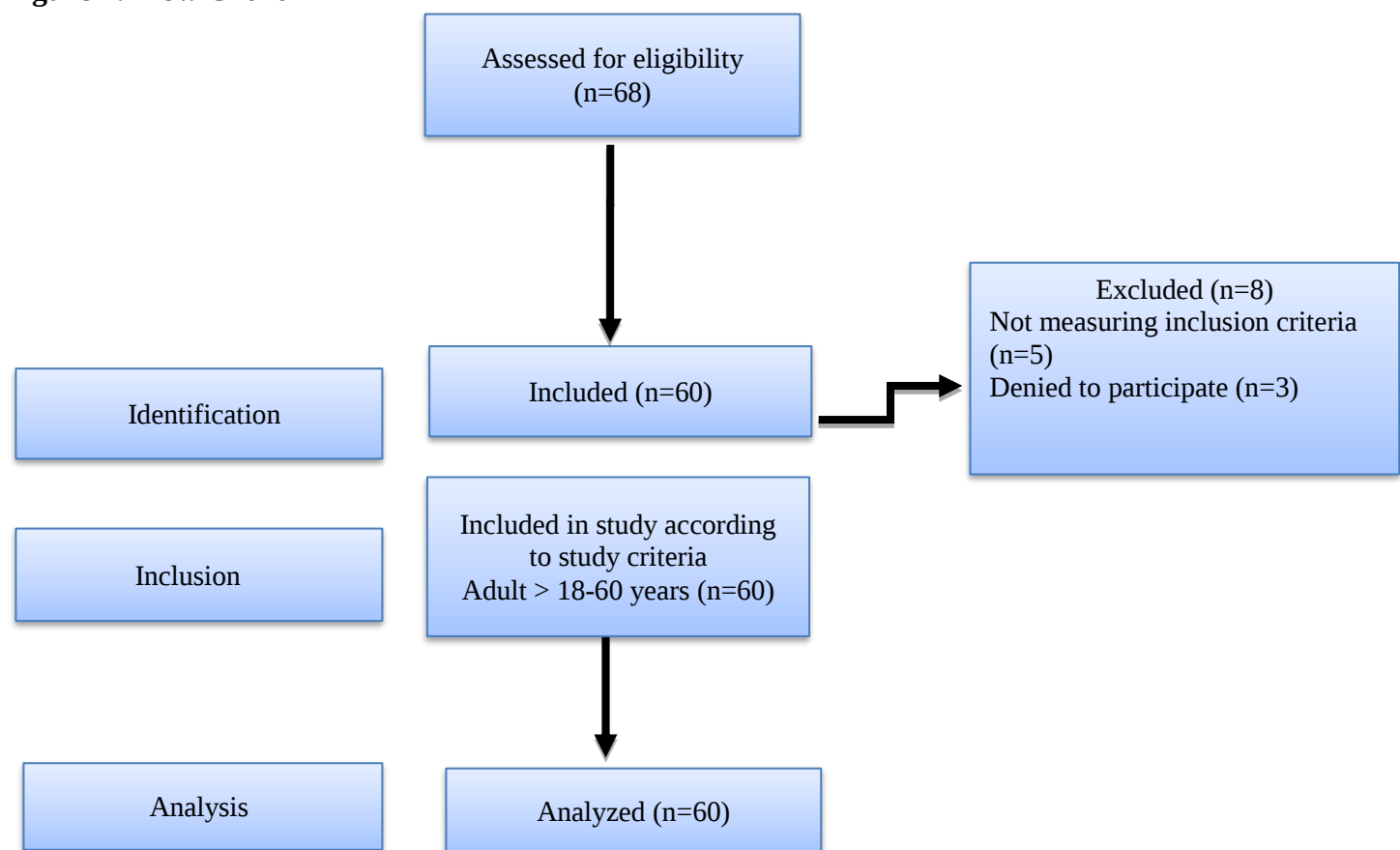


Figure 2: Incidence of POST with duration of surgery

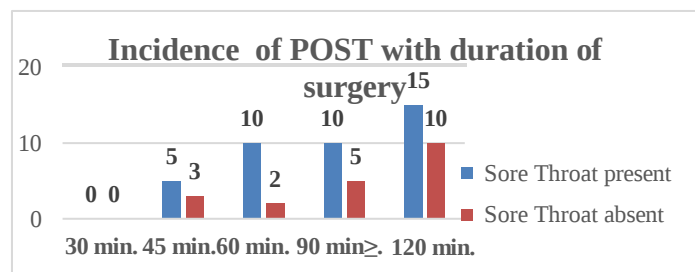


Figure 3: Alteration of cuff pressure at different interval from intubation

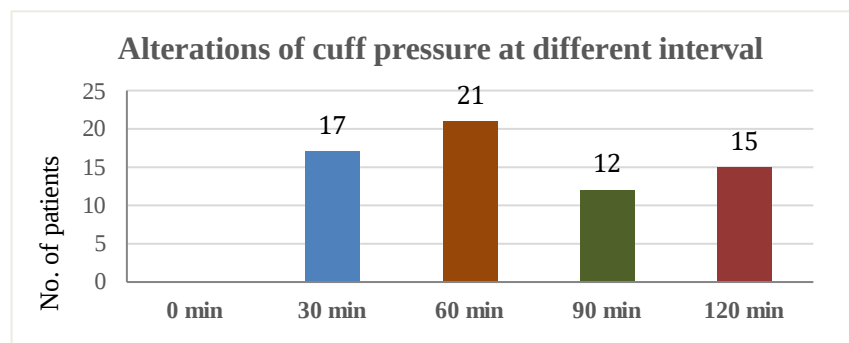
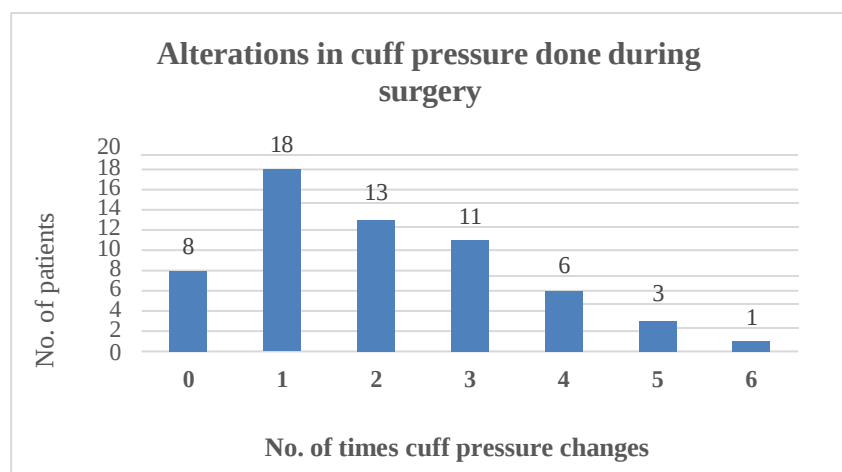


Figure 4: Alterations in cuff pressure done during surgery (No. of times)



Discussion:

Post operative sore throat is a stressful and uncomfortable consequence of tracheal intubation. It is undesirable post-surgery outcome and negatively affects patient's satisfaction and recovery following general anesthesia. The symptoms vary such as cough, pain, sore throat, discomfort, hoarseness of voice, dysphagia etc. due to the release of neurotransmitters, chronic inflammatory stimulation of the airway and injury to airway mucosa.⁶ Although most of the injuries are minor and reversible, variations may be due to different skills and techniques among anaesthesiologists, patient's physiology, number of attempts and ET tube size and ET cuff pressure. By examining these factors, we hope to contribute to the ongoing efforts to lessen the incidence and severity of this common postoperative complication. The present study investigated the incidence of postoperative sore throat (POST) and its potential correlations with various factors in patients undertaking elective surgeries in general anesthesia.

The overall incidence of POST in this study was found to be 66.67%. However, in our study the incidence of POST was higher as compared to study done Higgins et al.⁷ He evaluated the incidence of POST at 24 hr postoperatively in the tracheal intubation, laryngeal mask airway (LMA) and face mask(FM) groups. The incidence of POST was high with ET tube group (45.5%) followed by LMA group (17.5%) and FM group (3.3%). A systematic review by El-Boghdadly et al.¹ also reported an incidence of POST ranging from 14.4% to 50%. As our study was conducted in teaching institute and intubation was done by post graduate resident doctors, we found higher incidence of sore throat. Incidence of POST might be less if intubation would have been done by experienced anaesthetist (experience > 4 year).

The incidence of POST according to age and sex in our study showed that age group of 31-40 years is more prone for postoperative sore throat, with a higher incidence in females compared to males. This finding is in agreement with the study conducted by Zheng ZP et al.⁸ In oppose to our finding, Jaensson et al.⁹ suggested that the incidence of POST were higher after an ET tube than a laryngeal mask airway (LMA) (32% vs.19%, $p=0.012$). However, there was no significant gender difference in POST after an ETT insertion but POST after LMA insertion was more in women than men. Lautenbacher et al.¹⁰ found that aging decreases pain sensitivity and intensity suggesting age as a factor in POST. He also measured pain tolerance thresholds and found that men tend to have higher thresholds than women, suggesting that women become a factor influencing POST. Gemechu et al.¹¹ also found that female sex had significant association with POST(65.9% vs. 51.8%) due to tight fitting of ET tube because of anatomical difference in larynx between male and female.

However, our study did not find a significant correlation between the grade of sore throat and the post-operative interval, which was contrasted with the findings of Biro et al.³ He was evaluated the incidence of POST by VAS scale at 12-24 hrs postoperatively and found that 40% patients had POST and the average duration of sore throat was 16 ± 11 hrs. Main factors associated with throat pain are female sex, smoking, airway/lung diseases, anesthesia duration and blood stained ET tube after extubation. However, he reported a significant decrease in the occurrence of POST in the course of time ($p < 0.001$).

Number of intubation attempts had a significant association with POST. Multiple intubation attempts have

been associated with more incidence of POST as compared to single attempt. Gemechu et al.¹¹ reported that repeated attempts were 3 times more likely to develop POST than who were intubated in first attempt (47.5% vs. 76.7%). Obsa M et al.¹² evaluated the incidence of POST is 42.5% less likely to develop with single intubation attempt as compared to patients who had multiple intubation attempts. Study done by Fenta et al.¹³ also reported similar result (AOR=3.812, 95% CI: 1.134, 5.85). This might be due to soft tissue injury or trauma to mucosa around larynx during laryngoscopy and intubation since most of them were carried out by PG students in this study. Contrary to our finding, Higgins PP and Edomwonyi NP et al.^{7,14} found no association between POST and number of intubation attempts.

The duration of surgery was found to be an important factor influencing the incidence of POST in our study. Surgical time ≥ 120 minutes had the highest incidence of POST (60%), which is consistent with the findings of Inoue et al.¹⁵ who recorded a higher incidence of POST in prolonged surgeries (OR = 1.18, 95% CI: 1.08-1.29, $p < 0.001$). Edomwonyi NP et al.¹⁴ also reported that duration of intubation > 60 minutes associated with higher incidence of POST. This could be attributed to the prolonged contact of the endotracheal tube with the laryngeal and tracheal mucosa, leading to increased mucosal injury and inflammation.

The alterations in cuff pressure observed maximum after 60 min of surgery in our study. Chauhan P et al.¹⁶ reported that ETT cuff pressure was significantly rise in laparoscopic surgery after 5-10 min of CO₂ insufflations ($37 \pm 3-4$ cm H₂O) and in open surgery ($27 \pm 2-3$ cm H₂O) it was continuously raised till extubation. In laparoscopic surgery, carbon dioxide pneumoperitoneum shifts diaphragm upward causing increased intra-thoracic pressure leading to reduction of pulmonary compliance and rising of peak inspiratory pressure and airway pressure resulting in increased ET cuff pressure.¹⁶ Study done by Yildirim ZB et al. also found that Trendelenburg position and pneumoperitoneum may raise ET tube cuff pressure resulting in increased incidence of sore throat in laparoscopic surgeries.¹⁷

In our study, 86.67% of patients requiring at least one change in cuff pressure. This finding highlights the importance of regular monitoring and adjustment of cuff pressure to minimize the risk of POST. A study by Liu et al.⁴ found that maintaining cuff pressure between 20-30 cm H₂O significantly lower the incidence of POST compared to a control group (18.9% vs. 33.3%, $p = 0.015$).

Other post-operative complications such as cough (3.33%), discomfort (16.67%), and hoarseness (5.00%) were also observed in our study. These findings are consistent with previous studies reporting the incidence of cough (3.3%-44.8%), discomfort (10%-50%), and hoarseness (11.1%-21.1%) following general anaesthesia.^{1,18,19} Cough is independent risk factor of POST and Zheng ZP et al.⁸ also reported that cough during extubation time increases the incidence of POST, so careful attention should be given as a prevention strategies to reduce POST. Chahan P et al.¹⁶ found that incidence of complications like cough (27.5% vs. 2.5% respectively) and hoarseness (30% vs. 0% respectively) were higher in laparoscopic surgery than open surgery with significant p value (< 0.003). This is emphasizing the need for comprehensive post-operative care and follow-up.

Limitation:

Limitation of our study is that we had taken relatively small sample size of participants. In addition, the study was conducted at a single centre. Future multi-centre studies with larger sample sizes are required to validate our finding for more comprehensive cognizance into the factors influencing POST. As intubations are been performed by trainee anesthesia residents, their skills cannot be compared to experienced anesthesiologist. More skilled anesthesiologist should have been included for valid comparisons. Some important factors like size of ET tube, airway manoeuvres during intubation and extubation (intubation technique with ETT rotation of 180°, suctioning during extubation and suctioning pressure), coughing during extubation which are associated with POST were not inscribed in our study.

Conclusion:

We came to conclusion that high incidence of POST was noticed in the age group of 31-40 years, with females being more susceptible than males. Higher incidence was also observed with multiple intubation attempts and surgeries lasting ≥ 120 minutes, highlighting the importance of minimizing the duration of intubation period whenever possible. Use of endotracheal tube cuff pressure monitor and adjustment of cuff pressure is very useful to lower the occurrence and severity of POST. These findings help in improving preventive strategies to minimize its incidence and severity, which ultimately helps to improve patient satisfaction and outcomes.

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None

Conflict of Interest:

None

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