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Original Article

Postoperative Sore Throat after Endotracheal Intubation: Empirical Evidence of the Incidence and Risk Factors

Muhammad Umair Arif[1], Dr. Tooba Rana[2], Muhammad Adeel Khan Niazi[1], Qandeel Younus[1], Muhammad Nabeel Khan Niazi[1], Dr. Waqas Akram[1]

[1]Faculty of Pharmaceutical Sciences, University of Central Punjab, Lahore, Pakistan.
[2]Senior Demonstrator, Biochemistry Department, Allama Iqbal Medical College, Lahore, Pakistan.

Corresponding author:

Dr. Waqas Akram
Faculty of Pharmaceutical Sciences, University of Central Punjab, Lahore, Pakistan.
E-mail: waqas.akram@ucp.edu.pk

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ABSTRACT

The present study aims to find the incidence, severity, and risk factors for sore throat after surgery performed under general anesthesia with endotracheal intubation. A cross-sectional study involving 214 patients aged≥ 10 years in a tertiary care hospital. Patients with a history of sore throat or upper respiratory infection and/or at high risk for difficult intubation were excluded. Normal anesthetic procedure employed. Demographic data, endotracheal tube (ETT) size, and duration of anesthesia were gathered as well as intubation-related factors. 13% of the patients had some post-symptoms, and most of them (86.9%) had none. Of affected patients, 5.1% had mild and 7.9% had moderate symptoms; none had severe symptoms. POST was most reported at the 4th postoperative hour. Although larger ETT sizes and longer anesthesia duration showed higher odds of POST, no statistically significant association was found with age, gender, BMI, ASA classification, or urgency of surgery ($p > 0.05$). POST incidence in this study was relatively low compared to existing literature, with most cases being mild and self-limiting. Effective airway management and adherence to standardized anesthetic techniques play a key role in reducing POST.

Keywords: Airway Complications, Endotracheal Intubation, Endotracheal Tube (ETT), General Anesthesia, Perioperative Care, Postoperative Sore Throat (POST).

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INTRODUCTION

Despite the increasing development of anesthetic techniques, anesthesiologists have always been concerned about sore throats after endotracheal intubation. According to a recent study, the second most frequent minor adverse event following anesthesia recovery was postoperative sore throat (POST). (Lee *et al*., 2017) The cause of postoperative sore throat is irritation and inflammation associated with the endotracheal tube (ETT) in the trachea, although the exact process is yet unknown. Sore throats are a common side effect of endotracheal intubation, which can be quite distressing for the patient and lead to disturbed sleep and bad memories. Mucosal damage to the trachea or damage to the vocal cord could be the cause of POST, and these injuries can have other contributory variables. The size of the ETT, the degree of intubation difficulties, the length of the procedure, and female gender were previously identified risk factors for POST (Chang *et al*., 2017). Overinflation of the ETT cuff may harm the mucosa and result in POST. Regarding the age group most at risk of acquiring POST, the literature is inconsistent (Maria Jaensson *et al*., 2012). Individuals between the ages of 30 and 39 were more likely to have symptoms in one study, whereas individuals over 60 were most at risk in another (Bekele & Melese, 2023). Nonoptimal intubation circumstances and ETT size are risk factors linked to POST.

Although the exact anatomical location of patients' neck pain is unknown, the tracheal mucosa has been shown to release inflammatory mediators during intubation, indicating that the aetiology of postoperative sore throat (POST) is probably an inflammatory process (Rajkumar *et al.,* 2012). With varying degrees of success, numerous pharmacological and non-pharmacological trials have been employed to attenuate POST. Some non-pharmacological strategies that have been shown to reduce the incidence of POST include smaller endotracheal tubes, lubricating the endotracheal tube with water-soluble jelly, careful airway instrumentation, intubation after full relaxation, gentle oropharyngeal suctioning, minimizing intra-cuff pressure, and extubation when the tracheal tube cuff is fully deflated.

POST is frequently disregarded in clinical practice and can usually heal on its own. On the other hand, a tonic spasm of the pharyngeal muscles may result from POST. Aspiration pneumonia can happen in extreme circumstances, which can have a major impact on hospitalized patients' pleasure and their ability to recover from anesthesia (Chen *et al*., 2025). Up to 48–68% of women experience sore throats following endotracheal intubation, which is about twice as common in women as in males (Jaensson *et al*., 2010).

When positive pressure ventilation is needed and/or the airway needs to be protected from aspirating stomach contents, the cuffed tracheal tube (TT) is typically used. Several negative effects, such as sore throat and hoarseness, may be caused by the pressure the inflated cuff applies to the tracheal mucosa, or cuff-tracheal pressure (CTP) (Bennett *et al*., 2000). The prevalence and risk factors of POST in Lahore have not been evaluated in any previously published research on anesthesia professionals (Obsa *et al*., 2022). This study aims to assess the degree of postoperative sore throat (POST), & to determine the risk variables that lead to the development of POST after endotracheal intubation. Improving perioperative care and putting preventative measures in place requires an understanding of both the severity of POST and the factors that put patients at risk. The significance of research on sore throats following surgery establishes frequency (incidence), shows how common sore throats are after endotracheal intubation, and identifies the risk factors. Research helps identify components such as Size and kind of endotracheal tube, Intubation time and cuff pressure, Frequent or traumatic intubation, Use or non-use of lubricants, Patient-specific factors (age, gender, smoking history, airway sensitivity), Type and duration of surgery.

METHODS AND MATERIALS

Study Design and Setting

A cross-sectional study was performed in a tertiary care hospital to assess the incidence and risk factors that contribute to the occurrence of postoperative sore throat (POST) in patients who had undergone surgery under general anesthesia and endotracheal intubation.

Study Population

The patients were of either sex, aged 10 years and above, and had undergone surgical procedures under general anesthesia with endotracheal intubation during the study period.

Sample Size and Sampling Technique

A total of 214 patients were recruited using a convenience sampling technique during a routine hospital visit. Sample size is calculated from a recent article to detect a significant improvement in sore throat. By assuming 5% margin of error and 95% confidence level.

Inclusion Criteria

Patients aged ≥10 years, Patients having surgery under general anesthesia with endotracheal intubation., Patients who gave an informed consent.

Exclusion Criteria

Patients who have had a sore throat in the past. Infected patients with the upper respiratory tract. Towards hoarseness of voice in patients. Patients are expected to have a difficult airway. Patients that demand emergency surgery. Patients who are being intubated nasotracheally. Firstly, patients whose attempts were more than two. Refusal to participate by patients.

Data Collection and Outcome Measures

A data collection form was specifically designed to collect all patient data. It consists of three sections. The first section includes demographic data, which includes: Age, gender, body mass index (BMI), endotracheal tube size, duration of anesthesia, weight classification (ASA), and urgency of surgery, cuff pressure (Gauchan *et al*., 2024).

Second section includes risk factors any pre-existing respiratory disease, duration of tubes, anesthetic technique, duration of anesthesia, mallam Pati airway classification, any Naso gastric tube inserted, size of laryngoscope, induction agent, muscle relaxant agent, type of surgical procedure, duration of surgery, patient position, number of intubation attempt, type of lubricant use, CL grade, type of airway device and urgency of surgery (Seet *et al*., 2010).

The third section consists of two questions, which include post-operative hours of patients having post-operative sore throat, second question of the third to check the severity of post-operative complications at different post-operative hours.

Statistical Analysis

The cross-sectional study was performed in a tertiary care hospital on 214 patients; the data entries and analysis were carried out by using the Statistical Package of Social Sciences (SPSS) version 23. The frequencies and percentages were given as descriptive statistics. Chi-square test and binary logistic regression analysis were used to evaluate the association between independent variables and POST, as described in similar observational studies. A statistically significant p-value was taken as less than 0.05.

RESULTS AND FINDINGS

This study was conducted with 214 individuals. Many participants were aged 21–40 years (40.2%), followed by 41–55 years (37.4%). Participants aged above 56 years accounted for 17.3%, while only 5.1% were between 10 and 20 years.

Regarding gender distribution, 56.1% of participants were male, and 43.9% were female. In terms of body mass index (BMI), nearly half of the participants (48.1%) had a BMI between 25 and 29.9 kg/m². This was followed by 26.6% with BMI 18.5–24.9 kg/m², 21.5% with BMI greater than 30 kg/m², and only 3.7% with BMI less than 18.5 kg/m²

Table 1

Socio-Demographic Characteristic of Study + Participants (N= 214)

Variables	Frequency	Percent (%)
Age		
10-20 years	11	5.1
21-40 years	86	40.2
41-55 years	80	37.4
Above 56	37	17.3
Gender		
Male	120	56.1
Female	94	43.9
BMI		
< 18.5	8	3.7
18.5-24.9	57	26.6
25-29.5	102	48.1
>30	46	21.5

A wide variety of surgical procedures were performed, with Cholecystectomy (10.7%), ORIF humerus (8.9%), Appendectomy (8.9%), C-section (8.4%), and ORIF clavicle (7.9%) being among the most common. Regarding endotracheal tube (ETT) size, the majority of patients were intubated with 7.5 mm tubes (46.7%), followed by 7.0 mm (37.4%), while smaller proportions received 8.0 mm (8.9%), 6.5 mm (5.6%), and 6.0 mm (1.4%) tubes. In terms of duration of intubation, most patients (62.6%) had a duration between 60 and 120 minutes, while 22.9% had a duration greater than 120 minutes and 14.0% had a duration less than 60 minutes. Regarding patient positioning, the majority were in the supine position (90.2%), followed by prone (5.1%), lateral (3.7%), and lithotomy (0.9%).

Table 2

Anesthetic and Surgery-Related Characteristics of Study Participants (N = 214)

Variables	Frequency	Percent (%)
General Surgery	5	2.3
Orif Clavicle	17	7.9
cholecystectomy	23	10.7
laparotomy	6	2.8
Total abdominal hysterectomy	4	1.9
Femur nail	6	2.8
ACL repair	5	2.3
Orif humerus	19	8.9
appendectomy	19	8.9
Septoplasty	7	3.3
Cholelithiasis	8	3.7
laminectomy	7	3.3
PFNA	4	1.9
TP Fixation	3	1.4
C-section	18	8.4
THR	7	3.3
dynamic hip screw (DHS)	4	1.9

tonsillectomy	9	4.2
craniotomy	12	5.6
Orif Tabia	5	2.3
Size of ETT		
6.0 mm	3	1.4
6.5 mm	12	5.6
7.0 mm	80	37.4
7.5 mm	99	46.7
8.0 mm	19	8.9
Duration of tube		
< 60	30	14.0
60-120	134	62.6
> 120	49	22.9
Patient Position		
supine	193	90.2
lateral	8	
prone	11	5.1

Out of 214 patients, 13% developed post-operative sore throat, whereas the majority (86.9%) did not experience this complication. Most patients (86.9%) reported no sore throat. Among those who experienced POST, most cases were reported at the fourth postoperative hour (10.8%), followed by the sixth hour (1.9%) and the second hour (0.5%). Most patients (86.9%) had no symptoms (severity level 0). Mild severity (level 1) was observed in 5.1% of patients, while moderate severity (level 2) was reported in 7.9% of cases.

Table 3

Frequency of Post-Operative Sore Throat & Severity at Different Post-Operative Hours

	Frequency	**Percent (%)**
Hours		
second	1	0.5
fourth	23	10.8
sixth	4	1.9
none	185	86.9
Postoperative sore throat		
Yes	28	13.1
No	186	86.9
Severity		
0	186	86.9
1	11	5.1
2	17	7.9

The results indicate that gender was not significantly associated with POST ($p = 0.59$). Similarly, age groups did not show a significant association with POST ($p > 0.05$). Regarding ETT size, larger tube sizes showed higher odds of POST; however, this association was not statistically significant ($p > 0.05$). Duration of anesthesia also showed no significant association with POST, although a longer duration had relatively higher odds. In addition, ASA classification and urgency of surgery were not significantly associated with the occurrence of POST ($p > 0.05$).

Table 4

Factors associated with postoperative sore throat of patients who underwent general anesthesia with endotracheal intubation(N=214)

Variables	POST	POST	COR (95 % CI)	P-value
	Yes	No		
Sex				
M	11	83	1	0.59
F	17	103	0.803 (0.357-1.808)	
Age range				
10-20	0	11	1	0.38
21-40	11	75	0.629(0.223-1.775)	0.36
41-55	10	70	0.612(0.213-1.761)	
ETT Size				
6.0 mm	0	3		
6.5 mm	0	12		
7.0 mm	6	74		
7.5 mm	16	84	0.176 (0.49-0.62)	0.08
8.0 mm	6	13	0.14 (0.137-1.24)	0.117
Duration of Anesthesia				
<1 h	4	26		
1-2 h	16	119	0.788 (0.216-2.88)	0.719
> 2 h	8	41	0.689 (0.275-1.729)	0.428
ASA Classification				
ASA I				
ASA II	3	29		
ASA III	20	133	1.454 (0.405- 5.219)	0.56
ASA IV	5	23	2.101 (0.454-9.728)	0.34
	0	1		
Urgency of the case			186	
Elective	28	186	0	
Emergency	0	0		

DISCUSSION

This study aimed at assessing the prevalence and risk factors for postoperative sore throat (POST) in patients who had surgery for whom endotracheal intubation under general anesthesia was performed in a tertiary care hospital. The incidence of POST reported in the present study (13.1%) is not as high as that in many other international studies, ranging from 20% to 74%, which reported a rate of 57.5% in patients undergoing endotracheal intubation under general anesthesia in Korea. Likewise, postoperative sore throat is found to be one of the most frequent minor complications associated with great intensity with postoperative comfort and patient satisfaction after anesthesia, as a study carried out by. The relatively higher incidence noted by the current study might have been related to meticulous handling of the airway, uniformity of intubation procedures, and perhaps more experienced anesthetists in airway handling, and to the duration of the procedure, which was shorter in many patients. In the present study, the age ranged mostly from 21 to 55 years, and there was no significant association between age and the development of POST. This is like the results of other studies which have indicated a poor correlation between patient age and a sore throat after surgery. But airway sensitivity has been thought to be reduced in elderly patients, so that the

symptoms of the throat are underestimated when compared to younger patients. In the present study, the test results were not statistically significant, meaning that age may not be an independent factor for predisposing to POST.

The gender distribution in this study indicated a marginally higher occurrence of POST among females than males, yet it was not significant (Shah & Mapleson, 1984). Similarly, according to Andrea *et al*. (2011) The female gender has been reported as a risk factor for POST in a lot of previous literature, and females were more likely to have POST than males. In the same way, prior research indicated that women are at higher risk due to the small diameter of the airway and high fragility of the mucous membrane during intubation (Zuccherelli, 2003). However, no significant association was found in the present study, probably because of the use of balanced airway controls and the proper size selection of the ETT based on the patient. In the current study, however, odds for POST were generally higher for larger sizes of ETT but did not reach significance. Patients who were intubated with a 7.5 mm and 8.0 mm ET tube seemed to suffer more sore throat complications than those with smaller ET tubes. This finding has been corroborated by previous studies finding larger ETT as an important determinant of mucosal irritation and airway trauma (Birhanu Mengistu & Akalu, 2017).

McHardy and Chung (1999) found that larger diameter tubes cause greater contact pressure to the tracheal mucosa and cause inflammation and throat discomfort after surgery. There is no statistically significant answer to this question in the current research, perhaps because of the relatively small sample size and an unequal distribution over the tube sizes. Another factor reported to be a determinant of POST is the duration of anesthesia and intubation. This study found that those with longer anesthesia (>2 hours) had higher odds of sore throat than those with shorter anesthesia, but this association was not significant. Studies have shown similar results, suggesting that prolonged intubation provides constant pressure on the mucosa of the trachea, which promotes ischemia, swelling, and inflammation *(Joh et al*., 1987; Kolawole & Ishaq, 2008) while surgery may involve the repeated adjustment of the airways and suctioning, thereby contributing to the damage of the mucosa (Higgins *et al*., 2002). Unfortunately, no statistically significant difference was seen in the current study, but the present trend is in keeping with the current literature, where reducing intubation time may help decrease postoperative airway issues.

Regarding the severity assessment, most of the cases of POST manifested as mild or moderate, and most of their symptoms were observed in the first four postoperative hours. This timing is also seen in other literature, with sore throat symptoms typically worsening early post-extubation and improving over 24–48 hours (Lehmann *et al*., 2010; Navarro & Baughman, 1997). As most symptoms are mild, POST is mostly transient and self-limited. The findings of this study have important clinical implications. While it is a minor complication, POST is known to impact patients' postoperative care satisfaction and quality of recovery. Modifiable risk factors for the development of POST, including ETT size, duration of intubation, cuff pressure, and airway manipulation technique, may help identify factors to reduce its incidence (Tanaka *et al*., 2009).

The use of smaller ETT as appropriate, avoiding traumatic intubation, careful suctioning procedures, monitoring cuff pressure, topically applied lidocaine, and applying steroids may be some measures that result in better postoperative comfort. Despite this, this study has certain limitations. Since this was performed in a single center and the number of participants was relatively small, this might affect the generalizability of the results. Some relevant factors, like cuff pressure measurement, number of intubation attempts, laryngoscopy grade, smoke exposure, and anesthetist experience, were not analyzed (Farhang & Grondin, 2018; Fenta *et al*., 2020). Moreover, operative sore throat was conducted only in the early postoperative period, and delayed sore throat symptoms may not have been recorded in the study. Further multicenter studies enrolling larger populations of patients and incorporating more parameters related to the airways are also recommended to assess operatively induced sore throat more extensively.

CONCLUSION

It can be concluded that the postoperative sore throat is relatively low compared with the existing literature. The majority were mild and occurred early in the postoperative period and did not require any intervention. There were no notable correlations between POST and demographic or clinical factors, indicating that optimal airway management practices play the key role in reducing this complication. Binary logistic regression analysis was performed to identify factors associated with POST. In the

crude analysis, endotracheal tube (ETT) sizes had higher odds of developing POST compared to those with smaller ETT sizes. Similarly, patients with longer duration of anesthesia were more likely to develop POST compared to those with shorter duration. However, variables such as age, sex, BMI, ASA classification, and urgency of surgery were not significantly associated with POST in the adjusted model. Further focus on innovative methods of atraumatic intubation and the selection of equipment, following the standardized guidelines, is required to improve patient outcomes and patient satisfaction.

LIMITATIONS

This study has several drawbacks. The cross-sectional design and non-probability convenience sampling of the results limit their application to different institutional frameworks in different regions. Second, no intraoperative cuff pressure monitoring was performed, limiting the ability to evaluate its link to mucosal ischemia. Finally, the number of hours of surveillance was limited to the first 6 hours after surgery, thereby underreporting symptoms that would occur later.

RECOMMENDATIONS

The current use of the smallest ETT diameter appropriate to the size of the patient (such as 7.0 mm for female adult patients; and 7.5 mm for male adult patients), should be recommended by clinical guidelines to avoid mechanical mucous damage. Handheld manometers for continuous cuff pressure monitoring should be used to keep pressures below 25cm H_2O. Gentle airway instrumentation and standard post-extubation care educational workshops should be organized for junior staff in anesthesia.

CONTRIBUTIONS

This study aims to give baseline epidemiological data of POST in a large tertiary care setup in Pakistan. It offers local surgical teams evidence of the safety of existing intubation options and sets a benchmark for future anesthesia quality improvement efforts across the region.

FUTURE DIRECTIONS

To increase the findings' generalizability, future studies should employ multicenter prospective cohort designs with bigger sample sizes. Objective data, including computer-assisted intraoperative cuff inflation monitoring, accurate laryngoscopy grading systems, and longer periods of follow-up (24 to 48 hours) will allow for a more complete assessment of POST development.

DECLARATION

Ethical Consideration: This study strictly adhered to the Declaration of Helsinki and relevant national and institutional ethical guidelines. All procedures performed in this study were consistent with the ethical standards of the Declaration of Helsinki. The study was conducted according to ethical standards for research involving human participants. Confidentiality as well as the privacy of participants' data were ensured. Since we collected data from a private clinic with no review board, we got ethical approval from our university review board, named ORIC (Office of Research, Innovation, and Commercialization), and got it signed by the head of the clinic.

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