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RESEARCH ARTICLE
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TO STUDY THE INCIDENCE AND RISK FACTORS OF THE POSTOPERATIVE SORE THROAT IN PATIENTS UNDERGOING ELECTIVE SURGERIES UNDER GENERAL ANESTHESIA WITH ENDOTRACHEAL TUBE

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ABSTRACT:

Background: In general anaesthesia, there is an increased risk of postoperative morbidity due to tracheal intubation. One of the most common, uncomfortable, and unpleasant sequelae is postoperative sore throat. Reducing the risk of postoperative sore throat is important for improving patient outcomes.

Objective: To assess the incidence and factors associated with postoperative sore throat among patients undergoing elective surgery under general anaesthesia with endotracheal intubation.

Methodology: Patients' age, sex, weight, endotracheal tube (ETT) size, and the number of intubation attempts were recorded. A hospital-based cross-sectional study design was used. Binary and multivariable logistic regression analyses were conducted to evaluate associations between independent variables and the outcome. Adjusted odds ratios (AOR) with 95% confidence intervals (CI) were calculated. A p-value of < 0.05 was considered statistically significant.

Results: A total of 4,376 patients were included in the study. The incidence of postoperative sore throat within 24 hours after surgery was 43.78%**.** Multivariable logistic regression analysis identified several significant risk factors for postoperative sore throat: Age over 60 years (Incidence: 81.20%, AOR: 4.32, CI: 3.88–4.80, $p < 0.01$),Female sex (Incidence: 57.13%, AOR: 1.33, CI: 1.21–1.47, $p < 0.001$),Body mass index (BMI) of 25.5–30 kg/m² (Incidence: 77.92%, AOR: 3.53, CI: 3.15–3.94, $p < 0.002$),Large ETT size (≥ 8.0 mm) (Incidence: 74.70%, AOR: 2.87, CI: 2.52–3.25, $p < 0.04$),Multiple intubation attempts (Incidence: 82.20%, AOR: 4.62, CI: 4.14–5.16, $p < 0.001$),Intubation performed by junior residents (Incidence: 67.51%, AOR: 2.08, CI: 1.92–2.25, $p < 0.0002$),Duration of surgery more than 2 hours (Incidence: 78.19%, AOR: 3.58, CI: 3.20–3.99, $p < 0.001$),Cuff pressure of 21–25 cm H_2O (Incidence: 93.6%, AOR: 4.64, CI: 8.58–14.01, $p < 0.003$).

Conclusion: Patients over 60 years of age, females, and those with higher BMI are at increased risk for postoperative sore throat. The use of a larger ETT size, multiple intubation attempts, procedures performed by junior residents, longer surgery duration (> 2 hours), and higher cuff pressure (≥ 21 cm H_2O) also significantly contribute to the incidence of postoperative sore throat.

Keywords: Endotracheal tube, Body mass index (BMI), cuff pressure, expertise.

Introduction

Postoperative sore throat (POST) is a common and distressing complication following endotracheal intubation under general anaesthesia. It significantly contributes to postoperative morbidity and is

considered one of the most undesirable outcomes in the postoperative period. The incidence of POST varies widely across studies, largely due to differences in endotracheal tube (ETT) size, number of intubation attempts, expertise of the intubator, duration of surgery, cuff pressure, and patient-specific factors. [1]

The primary cause of POST is thought to be an inflammatory response triggered by mucosal damage during intubation. The tracheal mucosa releases inflammatory mediators following cell injury, leading to airway irritation and heightened sensitivity of sensory nerves. Although the exact anatomical location remains uncertain, symptoms can range from mild throat discomfort to severe pain, difficulty swallowing, and temporary voice changes. In rare cases, recovery may take months and may even result in lasting complications. [1,2]

The risk of POST is highest with endotracheal tubes, followed by laryngeal masks, and lowest with facemasks. [2]

Non-pharmacological strategies have also been explored to reduce the incidence and severity of POST. [2]

Numerous studies worldwide have evaluated the prevalence and risk factors of postoperative sore throat. In developed countries, significant research has focused on optimizing airway management techniques to reduce its occurrence. However, in developing countries like Ethiopia, few studies have been conducted on postoperative sore throat despite its high incidence. For instance, a study conducted in an Ethiopian referral hospital reported a rate of 45.6%, underscoring the need for better preventive measures and increased awareness. [2,3]

The incidence of POST can be influenced by the quality of anaesthesia care, availability of resources, and the expertise of healthcare professionals. In regions with fewer trained anaesthetists, the risk of POST may be higher due to improper intubation techniques and inadequate monitoring of cuff pressure. Addressing these gaps through education, training, and adherence to best practices can help reduce its burden in resource-limited settings. [2,3]

Although POST rarely delays hospital discharge, it can significantly impact patient satisfaction and overall recovery after surgery. It may lead to considerable discomfort, sleep disturbances, and dissatisfaction with anaesthesia care. Implementing proper preventive measures can enhance the patient experience and reduce postoperative complications. [4]

Understanding and addressing the risk factors associated with POST is essential for improving patient outcomes and satisfaction. Preventive strategies such as careful intubation techniques and optimal cuff pressure management can help minimize its occurrence. Further research, especially in developing countries, is needed to develop tailored strategies for reducing the burden of POST and improving the quality of anaesthesia care globally. [4]

Method and material:

- **Study location**– Department of Anesthesiology, Pacific Institute of Medical Sciences, Umarda, Udaipur, Rajasthan.
- **Study period**: December 2023 to November 2024
- **Study design**- Observational Prospective Cohort study with due permission from the institutional ethical committee and written informed consent.

Source population- All patient under general anaesthesia with endotracheal tube.

Study population- Patients who underwent surgery under general anaesthesia with endotracheal intubation who met inclusion criteria during the study period and rest excluded from the study.

Eligibility criteria:

Inclusion criteria:

- Ages 18 and above
- ASA physical status 1 and 2 [5]
- Either sex

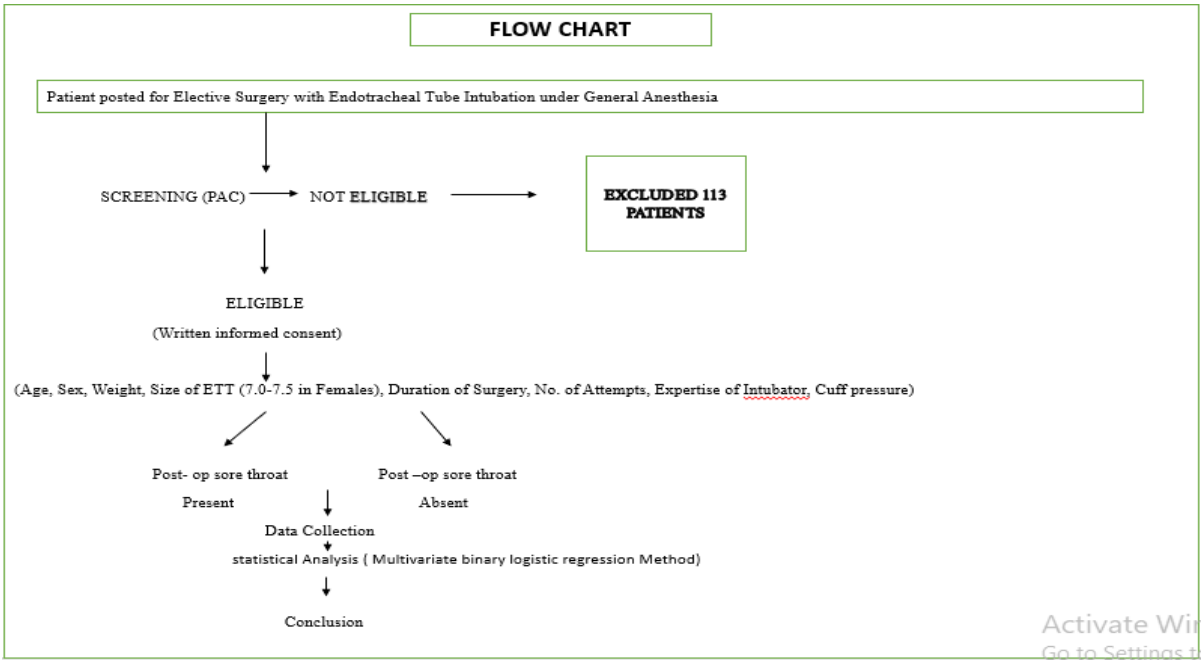
- General anesthesia with ETT
- Patients whose BMI 18.5kg/m² to 30 kg/m² [6]

Exclusion criteria:

- Patient's refusal
- History of allergy to any of the general anesthetic drugs.
- Emergency Surgeries
- ASA grade 3 & 4
- Patient of coagulopathy or on anticoagulant therapy
- Surgery of neck, mouth or throat area, Cesarean delivery
- Recent or Ongoing URTI
- Use of Nasogastric tube, Double lumen tubes
- Existing preoperative sore throat cases
- History of gastric reflux
- Recent anti-inflammatory medications
- Position other than supine or lithotomy
- Difficult or traumatic intubation
- Postoperative vomiting
- Unable to communicate with the researcher
- Pediatric patients
- Intubation by untrained staff
- Difficult intubation (more than 3 attempts)

Methodology:

Patient Data Collection, demographics and clinical details will be recorded on a standardized information sheet. This includes age, sex, weight, duration of surgery, tracheal tube size, cuff pressure, expertise of intubator, number of attempts. Note: Double-lumen endotracheal tubes (ETT) will not be used.



Assessment of Postoperative Sore Throat and Hoarseness: [1]

Patients will be interviewed at 0, 0.5, 1, 2, and 8 hours postoperatively, the incidence of sore throat was noted by using standard direct structured questionnaires. They will be asked: Whether they have

a sore throat or not. Whether they are experiencing hoarseness of voice. This structured approach ensures consistency in patient evaluation and outcome assessment. [1]

A four-grade scale was used as a point of reference: [1]
0= No sore throat
1=Mild sore throat
2=Moderate sore throat
3=Severe

Study variables: Post operative sore throat (positive or negative), Age, BMI, Gender predisposition, Size of endotracheal tube, Duration of surgery, Expertise of intubator, Cuff pressure, Number of attempts.

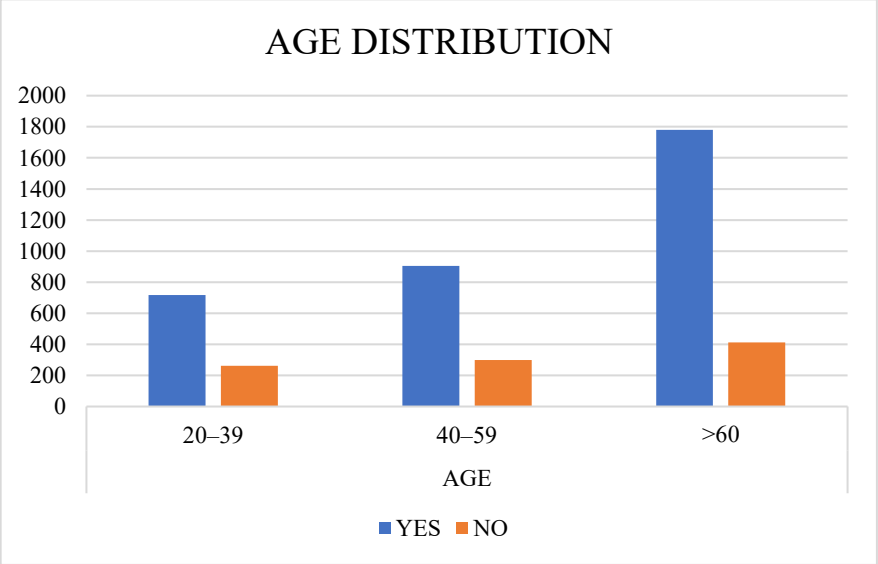
sample size – All the patients who underwent surgery under general anaesthesia with endotracheal tube where included. Total 4376 patients' data were collected who met inclusion criteria during the study period and 113 patients were excluded from the study.

Data collection technique and instrument- Data was collected using structured questionnaires prepared in English and then translated to local language. Data was collected by trained anaesthetists. The study tools included the age distribution, gender pre-disposition, BMI, size of endotracheal tube used, number of attempts during laryngoscopy, duration of anaesthesia, expertise of intubator, cuff pressure was recorded.

Data quality assurance- After giving training for data collection, data was collected and properly filled on the prepared format. close supervision was made during the data collection. We had supervised the data collectors and check for the completeness of the data daily.

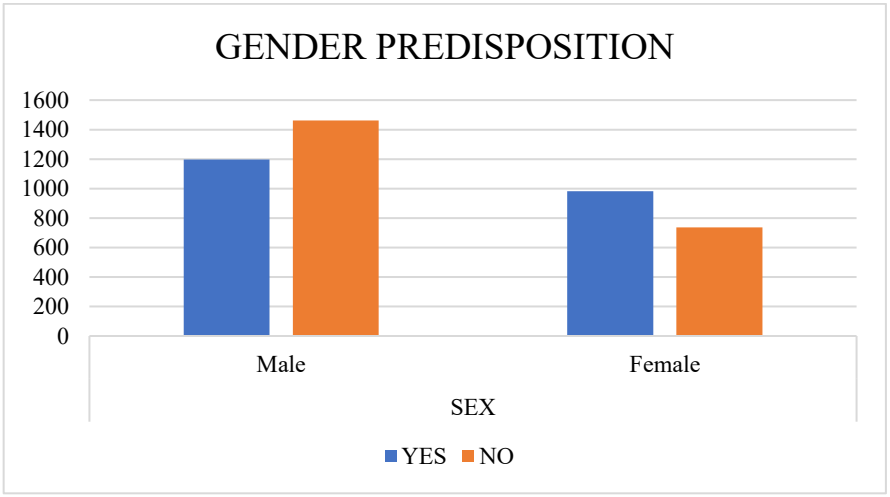
Result:

1) AGE DISTRIBUTION:



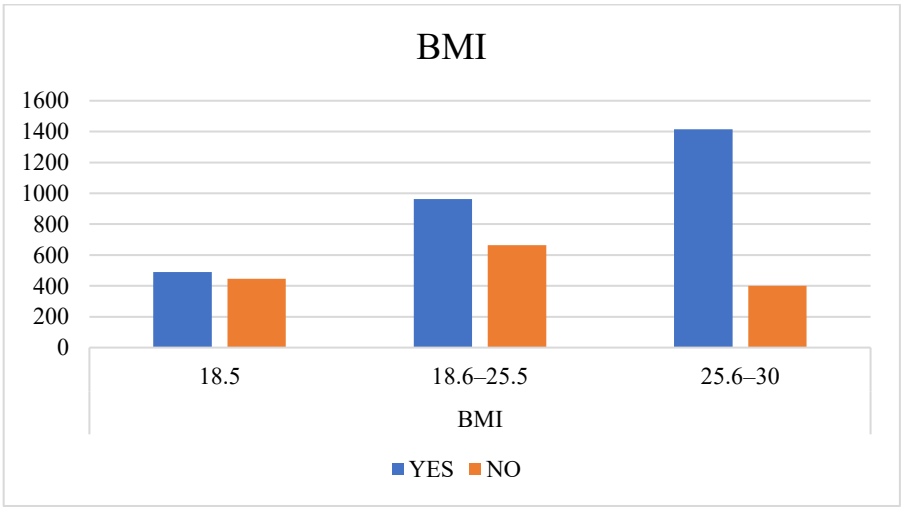
>60 YEARS OF AGE (I- 81.20%, AOR- 4.32, CI: 3.88 - 4.80, P<0.01)

2) GENDER PREDISPOSITION:



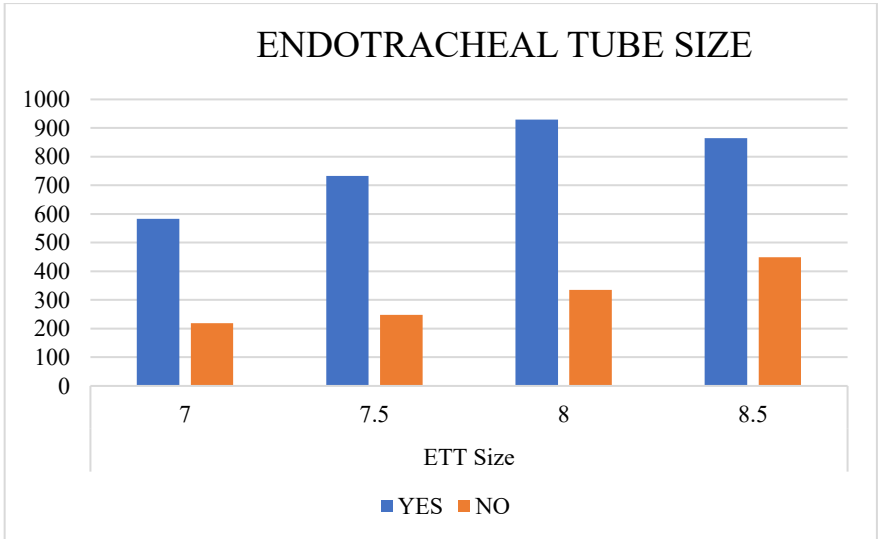
FEMALE (I-57.13%, AOR -1.33, CI: 1.21- 1.47, P<0.001)

3) BMI



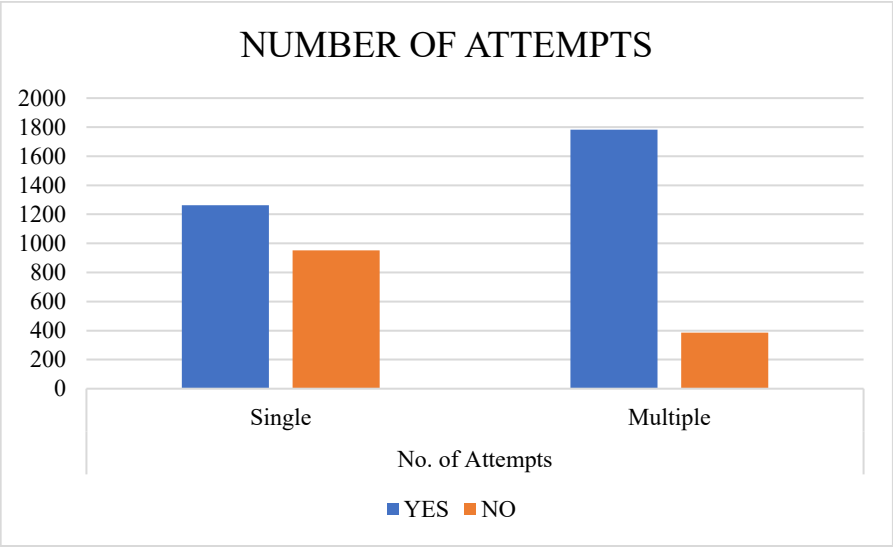
25.5-30 KG/M² (I- 77.92%, AOR - 3.53, CI: 3.15 -3.94, P<0.002)

4) ENDOTRACHEAL TUBE SIZE:



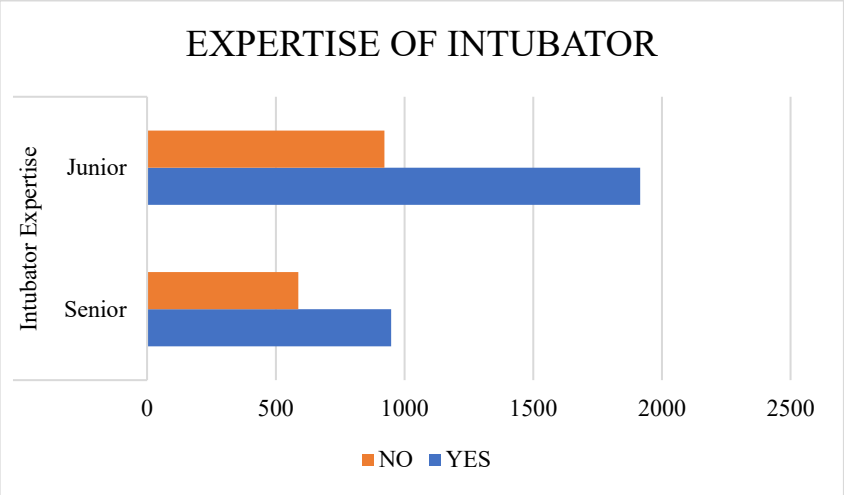
LARGER ETT SIZE (I-74.70%, AOR - 2.87, CI: 2.52 - 3.25, P< 0.04)

5) NUMBER OF ATTEMPTS:



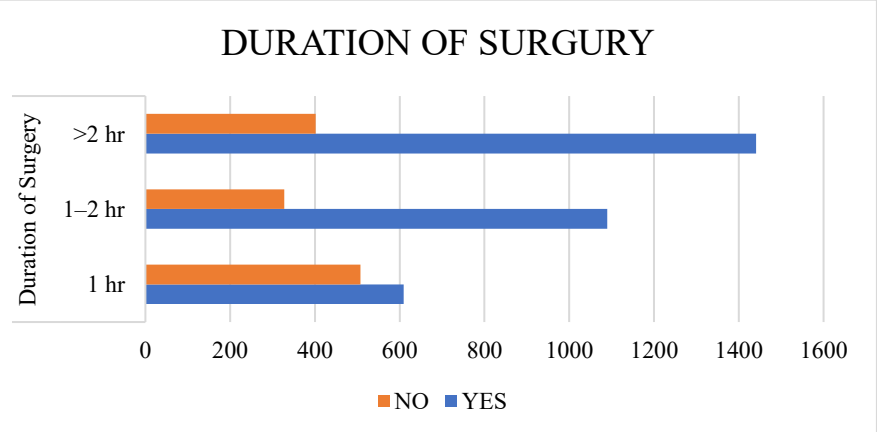
MULTIPLE (I-82.20%, AOR - 4.62, CI: 4.14-5.16, P<0.001)

6) EXPERTISE OF INTUBATOR:



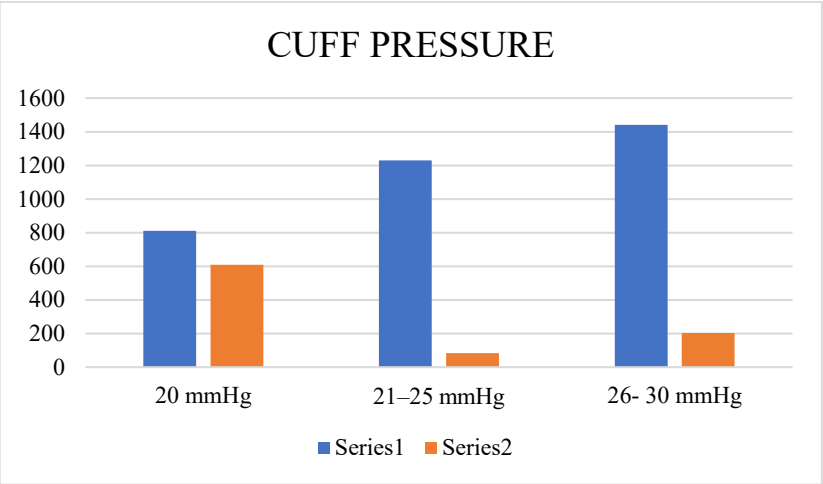
JUNIOR RESIDENTS (I-67.51%, AOR- 2.08, CI: 1.92-2.25, P<0.0002)

7) DURATION OF SURGURY



>2 HOURS (I-78.19%, AOR- 3.58, CI: 3.20 - 3.99, P<0.00

8) CUFF PRESSURE



21-25 CM OF H2O (I- 93.6%%, AOR-4.64, CI: 8.58- 14.01, P<0.003)

MASTER TABLE

Variable	Group	YES	NO	TOTAL	Incidence (%)	Odds (YES/NO)	CI	p value
AGE	20–39	718	262	980	73.27	2.74	2.38 -3.15	
	40–59	904	299	1203	75.15	3.02	2.65 - 3.44	<0.01
	>60	1779	412	2191	81.20	4.32	3.88 - 4.80	
SEX	Male	1196	1463	2659	44.98	0.82	0.76 - 0.88	
	Female	981	736	1717	57.13	1.33	1.21- 1.47	<0.001
BMI	18.5	489	446	935	52.30	1.10	0.97 - 1.25	
	18.6–25.5	962	663	1625	59.20	1.45	1.31 -1.60	<0.002
	25.6–30	1415	401	1816	77.92	3.53	3.15 -3.94	
ETT Size	7.0	583	219	802	72.69	2.66	2.28 - 3.11	
	7.5	725	256	981	73.90	2.69	2.33 - 3.10	
	8.0	945	320	1265	74.70	2.87	2.52 - 3.25	< 0.04
	8.5	880	434	1314	66.97	1.93	1.72 - 2.16	
Duration of Surgery	1 hr	609	507	1116	54.57	1.20	1.07 - 1.35	
	1–2 hr	1090	328	1418	76.87	3.32	2.94 - 3.76	
	>2 hr	1441	402	1843	78.19	3.58	3.20 - 3.99	<0.001
No. of Attempts	Single	1262	952	2214	57.00	1.33	1.22 - 1.44	
	Multiple	1783	386	2169	82.20	4.62	4.14-5.16	<0.001
Intubator Expertise	Senior	948	588	1536	61.72	1.61	1.45-1.79	
	Junior	1916	922	2838	67.51	2.08	1.92-2.25	<0.002
Cuff Pressure	20 mmHg	811	608	1419	57.1%	1.33	1.20 -1.48	<0.003
	21–25 mmHg	1230	84	1314	93.6%	4.64	8.58-14.01	
	26- 30 mmHg	1440	203	1643	87.64%	4.81	4.43- 6.36	

DISCUSSION:

- Postoperative sore throat (POST) is one of the most frequent subjective complaints following tracheal intubation for general anaesthesia, often leading to patient dissatisfaction after surgery. It is primarily attributed to trauma, local irritation, and inflammation of the airway, and may delay a patient's return to normal activities.
- Awareness of contributing factors can enable healthcare providers to minimize both the incidence and severity of POST, thereby improving the overall anaesthesia experience for patients.
- In our study, the incidence of sore throat was relatively high (43.78%), which is comparable to the cross-sectional study by Melkamu and colleagues in Gondar, involving 240 participants [16]. However, our results showed a higher incidence than the study conducted at Toronto Western Hospital, where only 12.1% of patients reported sore throat. [17]
- A statistically significant association was found between POST and age above 60 years, with a notably higher incidence in this group (Incidence: 81.20%, AOR: 4.32, CI: 3.88–4.80, $P < 0.01$) compared to younger patients. Similar findings were reported by Zenebe Bekele et al. [2], Dr. Shibu Sasidharan et al. [1], and Jansson and colleagues. [18] The increased susceptibility to POST in older adults may be due to age-related changes in the oral mucosa, which becomes thinner, smoother, and drier, with reduced elasticity and stippling. These changes are likely related to structural and functional modifications in the epithelium and dermis, including reduced fibroblast activity, decreased proteoglycan production, and diminished protein and collagen synthesis. [19] These age-related changes can predispose elderly patients to POST. [20,21]
- In contrast, studies conducted at Black Lion Hospital [16] and by Fenta et al. [22] found no significant association between age and POST. This discrepancy may be due to the presence of protocols for selecting appropriately sized endotracheal tubes (ETTs), as well as consistent application of calculated ETT sizes across all age groups at their institutions.
- In our study, female patients (Incidence: 57.13%, AOR: 1.33, CI: 1.21–1.47, $P < 0.001$) had a significantly higher association with POST compared to male patients (Incidence: 44.98%, AOR: 0.82, CI: 0.76–0.88, $P < 0.001$). Similar results were reported by Rena Gurung et al. [10], Mazzotta E et al. [7] and Na Yang et al. [8] Conversely, studies by Efrem Fenta et al. [4] and Mohammed Suleiman Obsa et al. [3] found a higher association in male patients. Some studies, such as that by Kartheekaeebu S.S.S. et al. [9] reported comparable results between male and female patients.
- Our study also showed a higher association of POST with BMI ranging from 25.6–30 kg/m² (Incidence: 77.92%, AOR: 3.53, CI: 3.15–3.94, $P < 0.002$).
- Results indicated that the size of the endotracheal tube significantly affected the incidence of POST. Incidences were as follows: Size 7.0: Incidence-72.69% (AOR: 2.66, CI: 2.28–3.11), Size 7.5: Incidence -73.90% (AOR: 2.69, CI: 2.33–3.10), Size 8.0: Incidence- 74.70% (AOR: 2.87, CI: 2.52–3.25, $P < 0.04$), Size 8.5: Incidence- 66.97% (AOR: 1.93, CI: 1.72–2.16). These findings suggest that larger ETT diameters can cause direct mucosal trauma, increasing the likelihood of POST. Similar results were reported by Biro P et al. [11], Mazzotta E et al. [7], Na Yang et al. [8] and Rena Gurung et al. [10]
- A significantly higher incidence of POST was also associated with multiple laryngoscopy attempts (Incidence: 82.20%, AOR: 4.62, CI: 4.14–5.16, $P < 0.001$), likely due to direct laryngeal trauma. Similarly, prolonged intubation lasting more than two hours was linked to increased POST (Incidence: 78.19%, AOR: 3.58, CI: 3.20–3.99, $P < 0.001$). These observations align with the findings of Gemechu B. M. et al. [12], Rena Gurung et al. [10] and Na Yang et al. [8] However, Kartheekaeebu S.S.S. et al. [9] reported a higher incidence with 1–2-hour durations.
- Our analysis also revealed that POST incidence varied depending on the experience of the individual performing intubation. A higher incidence was observed when intubation was performed by junior staff (Incidence: 67.51%, AOR: 2.08, CI: 1.92–2.25, $P < 0.0002$), likely due to increased mucosal trauma. In contrast, S. Inoue et al. [15] found no significant difference in POST incidence between intubations performed by trainees and consultants.

- Cuff pressure was another contributing factor. Higher cuff pressures (21–25 cm H_2O and above) were significantly associated with POST (Incidence: 93.6%, AOR: 4.64, CI: 8.58–14.01, $P < 0.003$), as elevated pressures may lead to tracheal mucosal inflammation and delayed recovery. Similar findings were observed in studies by Ratnaraj et al. [11], Dr. Shibu Sasidharan et al. [1], Mazzotta E [7] and Rena Gurung et al. [10]

CONCLUSION:

In this study the incidence of post operative sore throat was higher in females more than 60 years of age, obese BMI 25.6- 30 kg/m² with larger endotracheal tube size and duration of surgery lasting more than 2 hours depending on the multiple no. of attempts by junior expertise in intubation and high cuff pressure 21 -25 cm of H2O and above.

We recommend using smaller-sized endotracheal tubes, minimizing the number of laryngoscopy attempts, and regularly checking cuff pressure with a manometer to help reduce the incidence of postoperative sore throat. Addressing these factors can significantly improve patient comfort and enhance overall postoperative outcomes.

REFERENCES:

1) Sasidharan Shibu. To study the incidence and risk factors of post- operative sore throat in patients undergoing elective surgeries under general anaesthesia with endotracheal tube. Indian Journal of Medical Research.2020(7):1154-65.
2) Bekele Z, Melese Z. Incidence and risk factors for postoperative sore throat after general anesthesia with endotracheal intubation: prospective cohort study. *Ann Med Surg (Lond*). 2023;85(6):2356-2361.
3) Obsa MS, Adem AO, Bancha B, Gelgelu TB, Gemechu AD, Tilla M, et al. Global incidence and risk factors of post-operative sore throat among patients who underwent surgery: A systematic review and meta-analysis. *Int J Surg Open*. 2022; 47:1005-36.
4) Efrem Fenta, Diriba Teshome, Dessie Melaku, Aragaw Tesfaw, Incidence and factors associated with postoperative sore throat for patients undergoing surgery under general anesthesia with endotracheal intubation at Debre Tabor General Hospital, North central Ethiopia: A cross-sectional study, International Journal of Surgery Open.2020;(25):1-5.
5) Malik M, Urooj S, Imtiaz A, Arif AM. Evolution of ASA Physical status scoring system. Anaesth. pain intensive care 2021;25(2):225-232.
6) Zierle-Ghosh A, Jan A. Physiology, Body Mass Index. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2024; 1:1-30.
7) Mazzotta E, Soghomonyan S, Hu LQ. Postoperative sore throat: prophylaxis and treatment. Front Pharmacol. 2023; 14:2-18.
8) Na Yang, Qingyu Tao, Jingyi Niu, Junma Yu, Postoperative Sore Throat After General Anesthesia: A Narrative Review, Journal of Anesthesia and Translational Medicine. 2023;2(3):34-41.
9) Shanmugamalasubramanian, Kartheek Hajeebu S.S.S., Kuppusamy Suresh Kumar. Prospective bservational StudyontheIncidence ofPostoperativeSoreThroatinPatients undergoing Endotracheal Intubation under General Anaesthesia. IndianJAnesthAnalg.2018;5(9):1476-81.
10) Gurung R, Lohani S, Sinha A K. Incidence of postoperative sore throat in patient under general anesthesia with endotracheal intubation: *Int J Acad Med Pharm.*2023; 5 (2); 1479-1482.
11) Ratnaraj J, Todorov A, McHugh T, et al. Effects of decreasing endotracheal tube cuff pressures during neck retraction for anterior cervical spine surgery. *Journal of Neurosurgery: Spine*. 2002; 97:89-104.
12) Biro, P., B. Seifert, and T. Pasch. "Complaints of sore throat after tracheal intubation: a prospective evaluation." *European journal of anaesthesiology.*2005:307-311.

13) Gemechu BM, Gebremedhn EG, Melkie TB. Risk factors for postoperative throat pain after general anaesthesia with endotracheal intubation at the university of Gondar teaching hospital, Northwest Ethiopia. *Pan Afr Med J.* 2017; 27:127.
14) Inoue S, Abe R, Tanaka, Kawaguchi M. Tracheal intubation by trainees does not alter the incidence or duration of postoperative sore throat and hoarseness: a teaching hospital-based propensity score analysis. R J Anaesth. 2015;115(3):463–9.
15) Andrea L, Baker B. Factors affecting the incidence of sore throat following general anesthesia with endotracheal tube versus laryngeal mask airway. School Nurse Anesth.2011;14:888.
16) Mengistu SB, Akalu L. Magnitude and associated risk factors of post-operative sore throat following surgery by general anesthesia with endotracheal intubation in Black Lion Hospital, Addis Ababa, Ethiopia. *Int J Anesth Res.* 2017; 5:409–413.
17) Kalil DM, Silvestro LS, Austin PN. Novel preoperative pharmacologic methods of preventing postoperative sore throat due to tracheal intubation. AANA J 2014; 82:188–97.
18) Edomwonyi NP, Ekwere IT, Omo E, et al. Postoperative throat complications after tracheal intubation. Ann Afr Med 2006; 5:28–32.
19) ChawakaHJ, Haile M. Temesgen. Predictors of postoperative sore throat among elective surgical patients at Jima University Teaching Hospital,2015.
20) Lee SY, Shih SC, Leu YS, et al. Implications of age-related changes in anatomy for geriatric-focused difficult airways. Int J Gerontol [Internet] 2017; 11:130–3.
21) Kloub R. Sore throat following tracheal intubation. Middle East J Anesthesiol 2001; 16:29–40.
22) Fenta E, Teshome D, Melaku D, et al. Incidence and factors associated with postoperative sore throat for patients undergoing surgery under general anesthesia with endotracheal intubation at Debre Tabor General Hospital, North central Ethiopia: a cross-sectional study. Int J Surg Open 2020; 25:1–5.
23) Jaensson M, Gupta A, Nilsson UG. Risk factors for development of postoperative sore throat and hoarseness after endotracheal intubation in women: a secondary analysis. *AANA J.* 2012; 80:67-73.
24) Liu J, Zhang X, Gong W. Correlations between controlled endotracheal tube cuff pressure and post procedural complication *Anesth Analg* .2010;111:1133–1137.