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The Incidence and Associated Risk Factors of Post-Operative Sore Throat After General Anesthesia with Endotracheal Intubation: A Cross-Sectional Study

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ABSTRACT

Background: Postoperative sore throat (POST) is a frequent and distressing complication following general anesthesia with endotracheal intubation. Despite being self-limiting, POST significantly impacts patient satisfaction and postoperative recovery. The incidence and risk factors vary widely across populations, and data from developing countries remain limited.

Objective: To determine the incidence of postoperative sore throat and identify associated risk factors among patients undergoing elective surgery under general anesthesia with endotracheal intubation.

Methods: A cross-sectional observational study was conducted among 84 patients undergoing elective surgery under general anesthesia with endotracheal intubation. POST was assessed within 24 hours postoperatively using a standardized questionnaire and visual analog scale scoring. Data were analyzed using SPSS version 26.0.

Results: The incidence of postoperative sore throat was 48.8% (n=41). Female gender was significantly associated with POST (65.0% vs. 34.1%, p=0.006). Duration of anesthesia exceeding 2 hours was significantly associated with POST (p=0.012). Larger endotracheal tube size (7.5 mm) showed a trend toward higher POST incidence compared to 7.0 mm (58.3% vs. 41.7%, p=0.086). Multivariate analysis identified female gender (OR=3.85, 95% CI: 1.52-9.75) and anesthesia duration >2 hours (OR=3.24, 95% CI: 1.28-8.20) as independent predictors of POST.

Conclusion: POST remains a common complication after general anesthesia with endotracheal intubation, affecting nearly half of patients. Female gender and prolonged anesthesia duration were significant independent risk factors. Strategies including appropriate endotracheal tube size selection and minimizing intubation trauma may reduce POST incidence.

Keywords: Postoperative sore throat, general anesthesia, endotracheal intubation, risk factors, incidence

1. INTRODUCTION

Postoperative sore throat (POST) is one of the most common and unpleasant complications following general anesthesia with endotracheal intubation.[1] It is characterized by pain or discomfort in the larynx or pharynx, often exacerbated by swallowing or speaking.[2] Despite being self-limiting in most cases, POST significantly increases postoperative morbidity, delays recovery, and reduces patient satisfaction with anesthesia care.[3]

The reported incidence of POST varies considerably across studies, ranging from 21% to 90%.[4] This wide variation reflects differences in study populations, endotracheal tube characteristics,

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intubation techniques, cuff pressure management, and outcome assessment methods.[5] The multifactorial etiology of POST includes mucosal erosion from endotracheal tube cuff pressure, trauma during intubation, mucosal dehydration, and inflammatory responses.[6]

Several risk factors have been implicated in the development of POST. Patient-related factors include female gender, younger age, and higher Mallampati classification.[7] Procedural factors such as larger endotracheal tube size, prolonged anesthesia duration, use of nitrous oxide, and elevated cuff pressure have also been associated with increased POST incidence.[8] The expertise of the anesthesiologist performing intubation, however, does not appear to significantly impact POST incidence.[9]

Despite the clinical significance of POST, data from developing countries and diverse patient populations remain limited.[10] Understanding the local incidence and risk factors is essential for implementing targeted preventive strategies and improving anesthesia quality. This study aimed to determine the incidence of postoperative sore throat and identify associated risk factors among patients undergoing elective surgery under general anesthesia with endotracheal intubation at a tertiary care center.

2. METHODOLOGY

Study Design, setting and population

This study employed a cross-sectional observational design. The study was conducted in the Department of Anesthesiology and the Post-Anesthesia Care Unit (PACU) of a tertiary care teaching hospital. The target population comprised adult patients aged 18 to 65 years with American Society of Anesthesiologists (ASA) physical status I or II who underwent elective surgery under general anesthesia with endotracheal intubation during the study period.

Inclusion and Exclusion Criteria

Inclusion Criteria:

- Patients aged 18 to 65 years
- ASA physical status I or II
- Underwent elective surgery under general anesthesia with endotracheal intubation
- Duration of surgery less than 4 hours
- Willing to participate and provide informed consent

Exclusion Criteria:

- Patients with preoperative sore throat or upper respiratory tract infection
- History of difficult airway or anticipated difficult intubation
- Patients requiring more than two intubation attempts
- Patients who received intraoperative nasogastric tube
- Patients with known tracheal or laryngeal pathology
- Patients who underwent emergency surgery
- Patients with history of smoking
- Patients requiring postoperative mechanical ventilation
- Refusal to participate

Sample Size Calculation

Sample size was determined using Epi Info software version 7.2. Assuming a 95% confidence level, 80% power, and an anticipated POST incidence of 50% based on previous literature[4], with a margin of error of 10%, the calculated minimum sample size was 80 participants. Accounting for potential 5% attrition, the final sample size was set at 84 participants.

Procedure for Data Collection

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Preoperative assessment included documentation of demographic characteristics, Mallampati classification, and baseline airway examination.

Anesthesia was administered according to standardized departmental protocols. Endotracheal intubation was performed by experienced anesthesiologists or supervised residents. Endotracheal tube size selection was based on standard clinical criteria.[11] Intraoperative details including tube size, number of intubation attempts, duration of anesthesia and surgery, and use of nitrous oxide were recorded.

Outcome assessment was conducted at 24 hours postoperatively by trained research assistants blinded to intraoperative details. POST was assessed using a standardized questionnaire inquiring about presence, location, character, and intensity using the Visual Analog Scale (0 = no sore throat, 10 = worst imaginable sore throat).[12] For this study, POST was defined as any reported pain or discomfort in the larynx or pharynx, worsened by swallowing or speaking.[13]

Statistical analysis

Data were entered into Microsoft Excel and analyzed using SPSS version 26.0. Categorical variables were expressed as frequencies and percentages. Continuous variables were expressed as mean ± standard deviation or median with interquartile range as appropriate. Comparisons between groups were performed using chi-square or Fisher's exact test for categorical variables and independent samples t-test or Mann-Whitney U test for continuous variables. Multivariate logistic regression was performed to identify independent predictors of POST. A p-value < 0.05 was considered statistically significant.

3. RESULTS

Table 1: Baseline and Intraoperative Characteristics of Study Participants

Characteristic	Total (n=84)	POST Present (n=41)	POST Absent (n=43)	p-value
Age (years), mean ± SD	42.3 ± 12.6	40.8 ± 11.9	43.7 ± 13.2	0.289
Gender				0.006*
Male, n (%)	41 (48.8%)	14 (34.1%)	27 (65.9%)	
Female, n (%)	43 (51.2%)	27 (65.9%)	16 (34.1%)	
BMI (kg/m²), mean ± SD	26.4 ± 4.2	25.9 ± 3.8	26.9 ± 4.6	0.287
Mallampati Classification				0.142
Class I, n (%)	38 (45.2%)	15 (39.5%)	23 (60.5%)	

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Characteristic	Total (n=84)	POST Present (n=41)	POST Absent (n=43)	p-value
Class II, n (%)	46 (54.8%)	26 (56.5%)	20 (43.5%)	
Endotracheal Tube Size				0.086
7.0 mm, n (%)	48 (57.1%)	20 (41.7%)	28 (58.3%)	
7.5 mm, n (%)	36 (42.9%)	21 (58.3%)	15 (41.7%)	
Duration of Anesthesia				0.012*
≤ 2 hours, n (%)	44 (52.4%)	16 (36.4%)	28 (63.6%)	
> 2 hours, n (%)	40 (47.6%)	25 (62.5%)	15 (37.5%)	
Number of Intubation Attempts				0.673
Single attempt, n (%)	76 (90.5%)	37 (48.7%)	39 (51.3%)	
Two attempts, n (%)	8 (9.5%)	4 (50.0%)	4 (50.0%)	

*Statistically significant ($p < 0.05$)

Table 1 presents the baseline and intraoperative characteristics of the 84 participants stratified by POST occurrence. The incidence of POST was 48.8% (n=41). Female gender was significantly associated with POST development (65.9% vs. 34.1%, p=0.006). Duration of anesthesia exceeding 2 hours was also significantly associated with POST (62.5% vs. 37.5%, p=0.012). While larger endotracheal tube size (7.5 mm) showed a higher POST rate (58.3% vs. 41.7%), this difference did not reach statistical significance (p=0.086). Age, BMI, Mallampati classification, and number of intubation attempts showed no significant association with POST.

Table 2: Severity of Postoperative Sore Throat

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Severity Category	VAS Score	Frequency (n=41)	Percentage
Mild	1-3	18	43.9%
Moderate	4-6	16	39.0%
Severe	7-10	7	17.1%

Table 2 presents the distribution of POST severity among the 41 patients who developed the complication. Mild sore throat (VAS 1-3) was most common, affecting 43.9% of symptomatic patients, followed by moderate severity (VAS 4-6) in 39.0%. Severe sore throat (VAS 7-10) was reported by 17.1% of patients with POST. The mean VAS score among symptomatic patients was 4.2 ± 1.8.

Table 3: Multivariate Logistic Regression Analysis of Risk Factors for POST

Variable	Adjusted OR	95% CI	p-value
Female Gender	3.85	1.52 - 9.75	0.004*
Duration of Anesthesia > 2 hours	3.24	1.28 - 8.20	0.013*
Endotracheal Tube Size 7.5 mm	1.96	0.78 - 4.92	0.152
Mallampati Class II	1.54	0.62 - 3.82	0.352
Age (per year)	0.98	0.94 - 1.02	0.312

*Statistically significant ($p < 0.05$)

Table 3 presents the multivariate logistic regression analysis identifying independent predictors of POST. Female gender was the strongest independent predictor, with women having 3.85 times higher odds of developing POST compared to men (95% CI: 1.52-9.75, p=0.004). Anesthesia duration exceeding 2 hours was also a significant independent predictor (OR=3.24, 95% CI: 1.28-8.20, p=0.013). Endotracheal tube size, Mallampati classification, and age were not significant independent predictors in the multivariate model.

4. DISCUSSION

This cross-sectional study of 84 patients undergoing elective surgery under general anesthesia with endotracheal intubation found a POST incidence of 48.8%, with nearly half of all patients experiencing some degree of throat discomfort within 24 hours postoperatively. Female gender and prolonged anesthesia duration emerged as significant independent risk factors for POST development.

The incidence of POST in our study is consistent with previous investigations. A systematic review and meta-analysis by Hu et al.[1] demonstrated that endotracheal tube size significantly influences POST incidence, with smaller tube sizes associated with reduced POST rates. The

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variation in reported incidence across studies likely reflects differences in patient populations, outcome assessment timing, endotracheal tube characteristics, and definitions of POST used.[5]
The significant association between female gender and POST observed in our study is well-supported by existing literature. Hu et al.[1] in their meta-analysis examining endotracheal tube size and POST in female patients, found that women consistently demonstrated higher POST rates. This gender difference may be attributed to anatomical differences in airway caliber, hormonal influences on mucosal inflammation, and variations in pain perception.[7] These findings suggest that female patients may warrant particular attention in preventive strategies for POST.
The association between prolonged anesthesia duration and POST has important clinical implications. Studies examining the effect of cuff pressure management on POST have found that there is a significant increase in POST incidence with duration of surgery.[14] Park et al.[2] demonstrated that application of triamcinolone acetonide paste to the endotracheal tube significantly reduced POST incidence, with the effect being more pronounced in longer procedures. These findings collectively suggest that the duration of endotracheal tube presence in the airway contributes to mucosal injury through sustained pressure and potentially ischemia.[6]
The trend toward higher POST incidence with larger endotracheal tube size (7.5 mm vs. 7.0 mm) in our study, while not statistically significant, is consistent with the systematic review and meta-analysis by Hu et al.[1] which demonstrated that smaller endotracheal tube size significantly decreased POST incidence in female patients. Thomas and Beevi[3] further supported the role of pharmacological interventions in reducing POST severity, with dexamethasone demonstrating significant reduction in POST severity compared to controls

5. CONCLUSION

Postoperative sore throat remains a common complication after general anesthesia with endotracheal intubation, affecting nearly half of patients in our study population. Female gender and anesthesia duration exceeding 2 hours were significant independent predictors of POST. While endotracheal tube size showed a trend toward association, this did not reach statistical significance in the multivariate model. Preventive strategies should focus on appropriate endotracheal tube size selection, minimizing anesthesia duration when clinically feasible, and implementing routine cuff pressure monitoring. Female patients may warrant particular attention in POST prevention protocols. Future studies with larger sample sizes and prospective monitoring of cuff pressure are warranted to further elucidate modifiable risk factors.

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