

Evidence based local guideline for the prevention and management of postoperative sore throat in resource limited setting: systematic review

Abstract

Background: A sore throat is a discomfort, itching, quiet voice, or irritation of the throat that frequently gets worse when swallowed. Up to 62 percent of patients worldwide experience postoperative sore throat after general anesthesia. Postoperative sore throats reduce patient satisfaction and it can also increase the demand for adjuvant pain medication in the post-anesthesia care unit to minimize postoperative sore throat. Despite its status as most of the time self-limited, it has the potential to cause severe postoperative morbidity and patient unhappiness

Methods: Evidence was searched by using the keyword to access current and reliable information on risk stratification, prevention, and management of postoperative sore throat from May 2023 to October 2023. A literature search was conducted in different databases. The articles were searched using the Boolean operators. Randomized controlled trials (RCT), guidelines, systematic reviews, and meta-analyses.

Conclusions and recommendations: POST is linked to mental states like anxiety as well as to the most common patient characteristics, such as age, gender, and smoking. Anesthetists should act accordingly to minimize post-operative sore throat.

Keywords: sore throat, postoperative, anesthesia, management, guideline

Volume 12 Issue 1 - 2024

Atalay Eshetie Demilie,¹ Habtu Tsehaye Bayu,¹ Zewditu Abdissa Denu,² Yosef Belay Bizuneh,² Endale Gebreegziabher Gbremedihin²

¹Department of Anesthesia, College of Medicine and Health Science, Bahir Dar University, Ethiopia

²Department of Anaesthesia, College of Medicine and Health Sciences, University of Gondar, Ethiopia

Correspondence: Atalay Eshetie Demilie, Lecturer, Department of Anesthesia, College of Medicine and Health Science, Bahir Dar University, Bahir Dar, Ethiopia, Tel +251 993832848, Email atlyshe@gmail.com

Received: April 01, 2024 | **Published:** April 22, 2024

Background

Sore throat is a discomfort, itching, quiet voice or irritation of the throat that frequently gets worse when swallow.¹ One of the most common mild to severe complications and disturbing side effects seen by patients receiving general anesthesia with tracheal intubation is postoperative sore throat (POST).² Despite its status as most of the time self-limited, it has a potential to cause severe postoperative morbidity and patient unhappiness.² Postoperative sore throats reduce patient satisfaction and it can also increase the demand for adjuvant pain medication in the post-anesthesia care unit to minimize postoperative sore throat.³ Variety of treatments are used; however, no single intervention has proven to be totally successful.^{3,4}

Up to 62 percent of patients worldwide experience postoperative sore throat after general anesthesia.⁵ Sex being Female, advanced age, pre-existing lung disease, prolonged anesthesia & surgery and the presence of a blood stained tracheal tube during intubation all are highly associated with the POST.⁵ A cross sectional study conducted in Korea among of 207 the 119 (57.5%) develops POST. Cough during emergence and an Intracuff pressure greater than 17 cmH₂O were found to be risk factors for POST in a multivariate study.⁶

Follow up study carried out in Niger reveal that the prevalence of POST was (63%).⁷ Both males and females had the same rate of sore throat.⁷ The incidence and complications of POST was statistically significant on ENT surgery and application of oro-pharyngeal pack and aggressive suctioning were associated with POST.⁵ A hospital based cross sectional study conducted at Debretabor University, Amhara Northwest Ethiopia showed that the incidence of POST was 48.8%. Sex being female, endotracheal tube size, and number of attempts had significant association with POST.⁸

A hospital-based cross-sectional study done at the University of Gondar's specialized hospital revealed that a total of 143 out of

240 patients (59.6%) patients had developed POST within 48 hours following surgery under GA. Sex being female and, many attempts to intubate and the use of a nasogastric tube were associated with postoperative sore throat.⁹

Postoperative sore throat can be caused by a variety of reasons and the incidence has been observed to vary depending on the airway management approaches.¹⁰ The incidence is highest after tracheal intubation and ranges from 14.4% to 50%,² whereas the incidence after laryngeal mask airway insertion ranges from 5.8% to 34%, and it is significantly lower (<1.5%) when a face mask anesthetic maintenance was used.¹⁰

The postulated mechanism of POST is damage to the epithelium, the vocal cord and mucosal cells caused by airway securement and a lot of airway securement factors are contribute to postoperative sore throat such as an excessively big tube, cuff form, cuff pressure, congestion and blood clots are highly contribute to the occurrence of postoperative sore throat.¹¹ Routine tracheal intubation can result in pathological changes, trauma, and nerve injury which could all account for postoperative throat discomfort.¹² Several practice modifications that have demonstrated a reduction in the incidence of POST such as the utilization of smaller internal diameter ETTs and the routine measuring of intracuff pressure is too important to reduce the POST.¹³

Rationale

A typical side effect of general anesthesia is postoperative sore throat (POST).¹⁴ Even though POST is most common in patients who have been tracheally intubated it can also happen when a laryngeal mask airway (LMA) and even individuals who are handled with a facemask are susceptible to develop POST secondary mucosal dryness by the air.¹⁵ POST is preventable anesthesia and surgery related problem and the magnitude POST can be reduced by using

different prevention strategies since “prevention is better than cure”. Once this clinical problem is happened, it must be identified and treated early.¹⁶ If it remains untreated it may result in major respiratory complications.¹⁷ Anesthetists and other professionals should be aware about of this clinical problem and postoperative sore throat prevention and management strategies should be planned ahead of anesthesia and surgery.

In my clinical practice, I have seen that most anesthetists use high size of ETT and LMA in the absence of standard manometer which may increase the risk of POST. Additionally we inflate the ETT/LMA with air. A randomized control trial study done in Australia and a systematic review and meta –analysis recommend that inflation with saline and lidocaine is more important to basing and alkalization which creates a moisture to prevent mucosal damage.¹⁸ The incidence of early- and late-phase postoperative sore throat (coughing, agitation, hoarseness and dysphasia) decreased significantly (1a) (1c).^{19,20} So this gap of clinical practice may contribute for the increment the magnitude of POST.

A cross sectional study conducted in university of Gondar specialized compressive hospital shows that 59.6% of patients experienced postoperative sore throat within 48 hours of surgery.⁹ POST is highly associated with dysphasia, decrease patients satisfaction, increase hospital stay, increase analgesics consumption leads to additional costs for the patients & health institution and increase work load for health givers this sum total have a great effect on national and global economy.²¹

Methods

After setting eligibility criteria for the evidence to be used and choosing the best methodological approach, an extensive search for evidence was carried out. Different evidence was searched by using the keyword to access current and reliable information on risk stratification, prevention and management of post-operative sore throat from May 2023 to October 2023. A literature search was conducted in different data bases. The articles were searched using the Boolean operators. Randomized controlled trials (RCT), guidelines, systematic reviews, and meta-analyses (Table 1).

Resources from the PRISMA 2019 flow diagram database showing the prevention and treatment of post-operative sore throat were used.²²

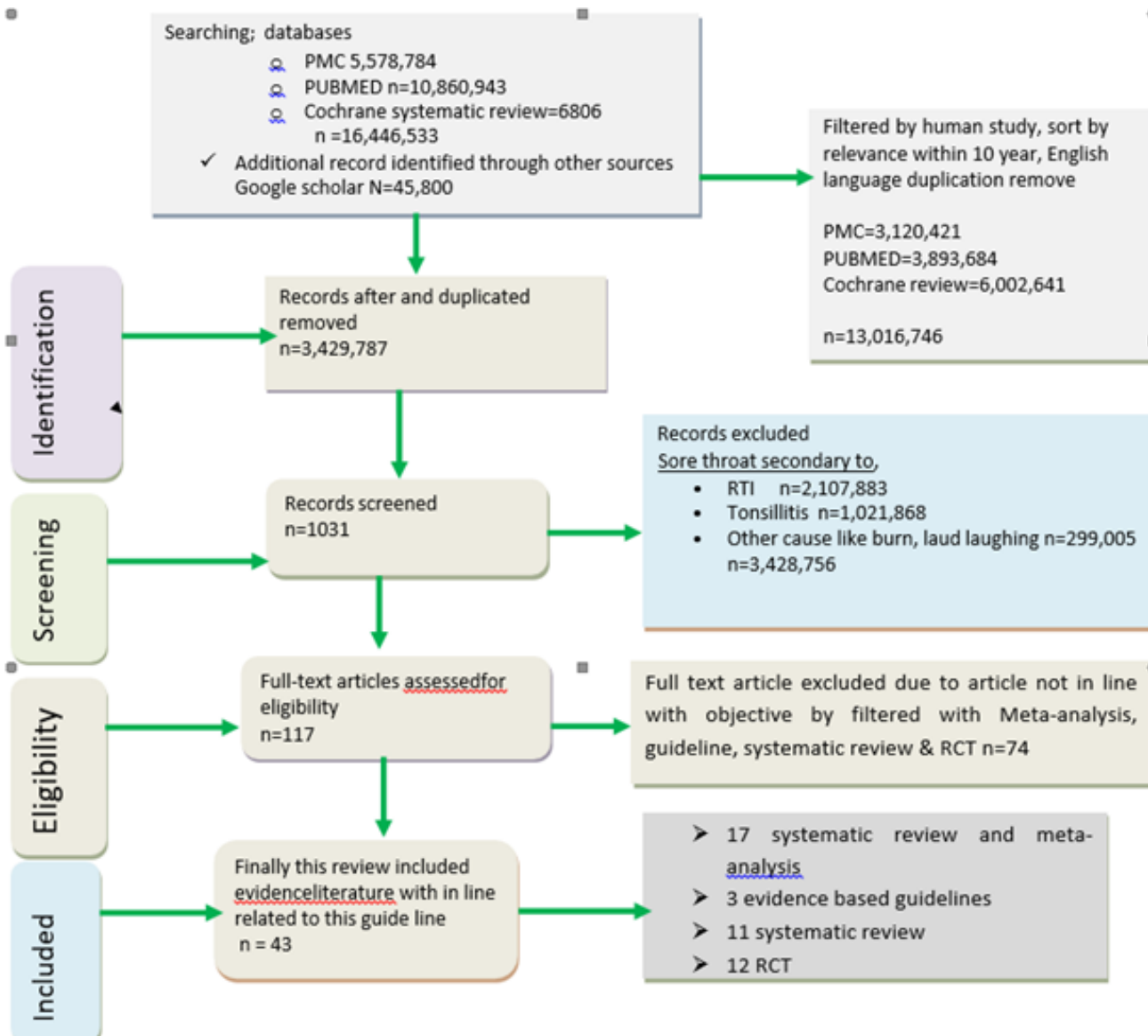


Table 1 Good clinical practice (GCP) WHO, 2011 (55) and was imported into (EndNote 20).²¹

Level	Type of evidence	Degree of recommendation
1.a	Meta-analyses, systematic reviews of RCTs, Evidence-based guideline	Strongly recommended/directly applicable
1.b	Systematic review of at list one RCT and other studies	Highly recommended/directly applicable
1.c	Randomized clinical trials/ RCTs	Recommended/ applicable
2.a	Systematic reviews of case-control or cohort studies.	Extrapolated evidence from other studies
3.a	Non-analytic studies, e.g., case reports, case series	Extrapolated evidence from other studies

Area of controversy

In order to treat postoperative sore throat (POST) non-steroidal anti-inflammatory drugs (NSAIDs), corticosteroids, lidocaine, and N-methyl-d-aspartate (NMDA) receptor antagonists are frequently used as topical medicines (including ketamine and magnesium) but which one is more ideal preventive drug is still controversial.²³

A meta-analysis of RCT by Wang, Qi et al.²⁴ suggested that glycyrrhizin; corticosteroids, NSAIDs, and NMDA receptor antagonists reduced postoperative pharyngeal pain across the postsurgical time intervals studied. 24,25 However, no difference was found between the lidocaine and the placebo during the early extubation, 4 to 6 hours' time interval, and 24 hours' time interval (1a).²⁵

A systematic review and meta-analysis study done by Grigoryan et al.²⁶ and Makkar et al.,²⁷ the overall incidence of POST was higher in the lidocaine group than in the normal saline group (58%) vs (39%). The overall incidence of cough for 24 hours postoperatively is higher in the lidocaine group than the saline because that the topical lidocaine may cause the irritation of the mucosal of the airway (1a). So the irritation feature of lidocaine after spray to oro pharyngeal is has been supported by systematic review and meta-analysis so it is better to avoid lidocaine topically.²³

A randomized control trial study done by Tanaka et al.²⁸ study shows that topical and systemic lidocaine therapy appeared to reduce the risk of postoperative sore throat. The severity of sore throat as measured on a visual-analogue scale (VAS) was reduced on systemic lidocaine than topical lidocaine therapy (36%) vs (79%) respectively (1c).²⁸ So, it is better to use systemic lidocaine.^{29,30}

Table 2 Summary of articles reviewed on the risk stratification of postoperative sore throat

Authors/year	Title	Design	Risk factor	Outcome	Degree of risk
El-Boghdady et al. 2016 ⁵	Postoperative sore throat	systematic review	Supra glottic airway ,high ETT/LMA cuff pressure	Increment of POST	Highly risk
Tay et al. 2002 ²⁹	Postoperative sore throat after oral surgery peresene of pharyngeal pack	RCT	Use of pharyngeal pack	Increment of POST	High risk
Ahmed A et al., 2007 ¹⁰	POST after elective surgery	Prospective observational study	old age difficult intubation pt. position	Increase POST	High risk
Obsa M et al. 2023 ⁷	Global incidence and & risk factor for POST	Systematic review and meta-analysis	Age,sex,duration of surgery, number of attempted if intubation	Incidence of POST	High risk

37,38

Prevention of postoperative sore throat

According to the British and Irish Association of Anesthetists adjusting the cuff pressure guided by objective measurement rather than subjective measurement or observation of the pressure value

The new style of ETT (Taper Guard ETT) would reduce or increase the occurrence of POST is general anesthetists issues when compared to the cylindrical shaped ETT which one more related to POST and respiratory complication associated with endotracheal intubation currently still controversial.³¹

A single blind randomized study done by Choi et al.³² the cuff pressure was higher in the taper guard ETT than in the cylindrical ETT and the incidence of POST was greater in the taper guard ETT than in the cylindrical ETT. However a double blind randomized study done by Kim 2018 shows that though the cuff pressure difference among the taper guard ETT than in the cylindrical ETT there is no significant difference the incidence of POST(1c).³³ A systematic review showed there is no difference between cuff and uncuff ETT at the occurrence of post-operative air way complications like sore throat and hoarseness (1b).³⁴

A meta-analysis conducted at Guangzhou in China concluded that there is significant difference between cuffs and uncuffed ETT for the occurrence of post-operative airway complications.³¹ Cuffed ETTs have lower complications and uncuffed tub are highly associated with sore throat and hoarseness of voice. ³⁴ This is supported by RCT study showed that the use of uncuffed tubes results significantly higher incidence of sore throat than the use of cuffed tubes.³⁵ The possible reason is that the air leaks created during spontaneous respiration and controlled ventilation in patients with uncuffed tracheal tubes allow air leak and loss of humidity to upper airway mucosa, causing some dehydration and damage to these cells (1a).³⁶

Discussion

Risk stratification for postoperative sore throat

A systematic review and meta-analysis done at Wolaita Sodo, Ethiopia in 2022 showed that advanced age, sex being female more worsens during pregnancy, smokers, weight more than 70 kg are highly risky to develop postoperative sore throat underwent surgery under general anesthesia.¹⁰ Additionally a prospective cohort study in Asmara showed that prolonged duration of anaesthesia more than 100 minutes, use of double-lumen tube, large size of ETT and LMA, multiple of attempts of intubation, the presence of blood on ETT during intubation, use of NGT, aggressive suctioning and use of suxamethonium are highly linked to the occurrence of postoperative sore throat (Table 2).^{3,17} A RCT conducted in Singapore in 2022 showed that use of pharyngeal packs was highly associated with postoperative sore throat (Table 2).²⁹

alone is highly beneficial in preventing the sore throat.¹⁴ A prospective randomized study shows that the use of HME filter which serve heat and moisture during expiration to prevent mucosal dryness and cell damage and reduce the occurrence of POST.³⁸ Another meta- analysis study suggests that intravenous dexamethasone can effectively reduce the incidence of POST both at 1 and at 24 hours postextubation.³⁹

Topical method of application which involved soaking the ETT in a dexamethasone solution or gargling the dexamethasone solution 10 min prior to induction.¹ These methods demonstrated a clinically significant reduction in POST from 63% to 26% and 63% to 33% at 24 hrs. postoperatively.^{39,40}

Table 3 Summary of articles reviewed on the prevention of postoperative sore throat

Authors/year	Title	Design	Intervention	Outcome	Recommendation
Zhao X et al. 2015 ³⁹	Dexamethasone for the prevention of POST	Systematic review and meta-analysis	Intravenous, topical and soaking the ETT in a dexamethasone solution or gargling	Reduction of incidence and severity of POST	Strongly recommend
Wang G et al. 2021 ⁴¹	Comparative of efficacy of topical pharmacological agent for prevention of POST	A systematic review and meta-analysis	topical glycyrrhizin, corticosteroids & NMDA antagonists	Reduction of incidence and severity of POST	Recommended/ applicable
Loeser, EA et al. 2017 ⁶	Maintaining endotracheal tube cuff pressure	Systematic review	Cuff pressure should be maintained at < 20 mmHg (26 cmH2O)	POST within 24 reduce post-operative airway symptoms	Highly recommended
Winkel and Knudsen 1999 ⁴⁰	Topical application of steroids for reduction of POST	systematic review and meta- analysis	Lubrication with 1% hydrocortisone	Reduction of sore throat	Strongly recommend
Obsa Met al. 2022 ³⁷	Global incidence and risk factor for POST	Systemic review and meta- analysis	Exploration of risk factor of POST	Reduction of POST	Highly recommended
Wang, Qi et al. 2021 ⁴¹	The role of suxamethonium in POST	A Meta- analysis of Randomized	Non depolarizing muscle relaxants, lidocaine, magnesium prevented fasciculation	Reduction of POST by reduction of myalgia	Strongly recommended
Wong JGI et al. 2009 ²³	Impact of LMA cuff pressure on incidence of POT	RCT	Measuring cuff pressure	Measuring cuff pressure reduce POST	Recommended
Christensen et al. 1994 ¹⁴	Post-operative throat complains after tracheal intubation	Follow-up study	Tracheal intubation	Occurrence of POST	
Furqan A et al. 2016 ⁴³	Effect of applying lidocaine gel and diclofenac gel	A single blind randomized trial	Lidocaine and diclofenac	Reduction of postoperative sore throat, hoarseness of voice and cough using scoring method of sore throat with grades	
Waruing D et al. 2019 ³⁵	RCT effect of LMA on POST in spontaneous breathing	RCT	Reduction of cuff pressure	Reduction of POST hoarseness and dysphasia	Highly recommended
Shroff & Patil, 2009; Yang et al. 2020 ¹⁹	basing and alkalization of ETT cuff	systematic review and Mata analysis	inflation with saline and lidocaine recommend that inflation with saline and lidocaine	Reduction of POST, coughing, agitation,	Strongly recommended
Tanka Y 2015 ²⁸	Lidocaine for prevention of POST	A systematic review	Lidocaine	Reduction of POST	Strongly recommended
El-Boghdady et al. 2016 ⁵	POST systematic review	systematic review	Limitation of cuff pressure	Reduction of POST	Highly recommended
Tay JJ et al. 2002 ²⁹	POST after routine oral surgery influenced by pharyngeal pack	RCT	Presence of pharyngeal pack	No difference	
Lee S et al. 2016 ¹	The prophylactic effect of dexamethasone on POST	RCT	Dexamethasone	Reduction of POST	Recommended
Waruingi et al. 2019 ³⁵	RCT of effect of LMA on spontaneous breathing	RCT	LMA with lubrication	Reduction of POST	Recommended
Agarwal a 2009 ⁴⁴	An evaluation of the efficacy of lidocaine gargle on POST single blind RCT	prospective, randomized, singleblinded study	licorice gargle	No change	
Hayward G, et al. ³⁰	Corticosteroids for pain relief in sore throat	systematic review and meta- analysis	Corticosteroids	Reduction of POST	Strongly recommended
Lee et al 2017 ⁴⁵	Combination of iv paracetamol and dexamethasone prospective randomized study	prospective randomized study	Combined intraoperative paracetamol & dexamethasone	reduces postoperative sore throat:	Recommended

Table 3 Continued...

Authors/year	Title	Design	Intervention	Outcome	Recommendation
Pelucchi Cet al. 2012 ²⁶	Guideline for the management of acute sore throat	Guideline	40 mg in 30 ml of saline ketamine 5 min before induction of general anesthesia	effectively reduced the severity of POST at 24 hr postoperatively	Highly recommended
Furqan et al. 2016 ⁴³	Effect of lidocaine and diclofenac gel	A randomized control trial study	Local application of lignocaine gel plus diclofenac sodium over the endotracheal tube reduction of grading of POST	hemodynamic control and significantly reduces the incidence of postoperative sore throat	Recommended

A systematic review and meta-analysis of randomized controlled trials conducted in Shenyang, China by 2021 regarding covering topical prophylactic medications with NMDA receptor antagonists ketamine and magnesium showed magnesium demonstrated greater benefit than ketamine at 24 hours post intubation in terms of magnitude developing POST.⁴¹ Additionally, another study showed that gargling of (40 mg in 30 ml of saline) ketamine 5 min before induction of general anesthesia effectively reduced the severity of POST (Table 3).²⁶

Management of postoperative sore throat

According to the American and European sore throat guidelines recommend that oral penicillin is the first-line treatment of post-operative acute sore throat.⁴⁰ Additionally a systematic review of

randomized-controlled trials (RCTs) shows that non-steroidal anti-inflammatory drugs diclofenac and ibuprofen and paracetamol are more effective than placebo for reducing acute sore throat symptoms.⁴¹⁻⁴⁵ Another systematic review also showed that ibuprofen 200-300mg and paracetamol depending on the severity of grading if score of grading less than <2 10-15mg/kg and grade of coring 3, 15-20mg/kg are more effective than placebo for reducing acute sore throat.⁴⁶ Additionally a double-blind randomized control trial demonstrates that administering honey and lemon in tea after surgery greatly decreased POST.⁴⁷ The severity of a sore throat was graded as follows: 0 means there has never been a sore throat since the operation; 1 means it is minimal and less severe than a cold; 2 means it is moderate and more severe than a cold; and 3 means it is severe and more severe than a cold (Table 4).⁴⁸⁻⁵⁰

Table 4 Summary of articles reviewed on the management of postoperative sore throat

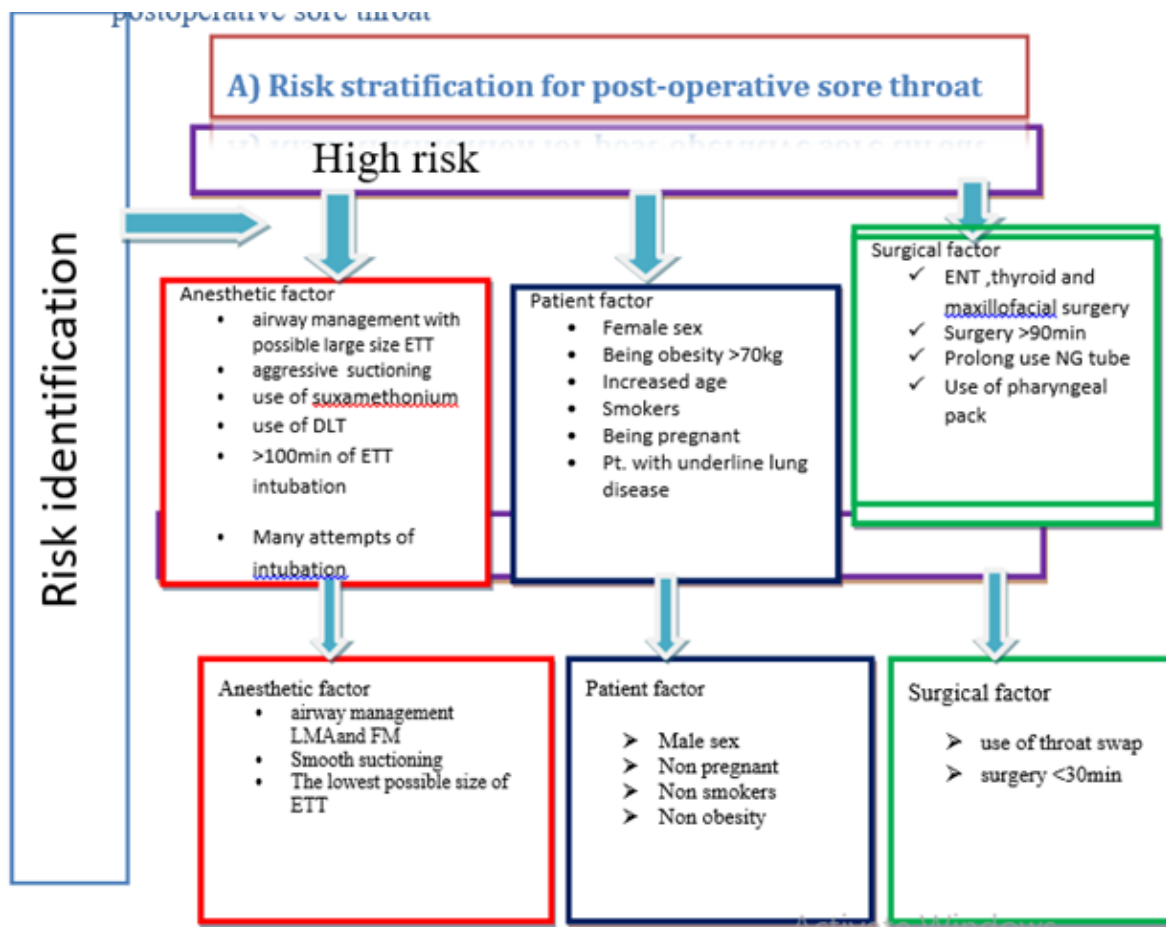
Authors/years	Title	Design	Intervention	Outcome	Recommendation
Kerdelmidis M et al. 2009 ⁴	Guideline for sore throat management New Zealand	Evidence-based guideline	penicillin V	Reduction of POST	Strongly recommended
Paul L and Ian W. 1996	Sore throat management practice	Guidelines	Antibiotics	Reduction sore throat symptoms	Strongly recommended
Watson Net al. 2000 ⁵⁰	Relief of sore throat with NSAID randomized double blind study	Double blinded RCT	NSAID and paracetamol compared with placebo	reducing acute sore throat symptoms	Highly recommended
Thomas Met al. 2000 ⁴⁶	How effective are treatment than antibiotics for acute sore throat	systematic review of RCT	10-15mg/kg pcm and ibuprofen 200-300mg	reducing acute sore throat symptoms both in children and adult	Highly recommended
Hayward Get al. 2009 ³⁰	Corticosteroid for pain relief in sore throat	A systematic review and meta-analysis	single dose of corticosteroids in conjunction with antibiotic application	Reduce the severity of POST highly suppression of cough and if severity consists grade three	Strongly recommended
Titinchi et al., 2010 Rajai et al. 2022 ^{47,48}	The effect of lemon tea and honey for relive of sore throat symptoms	double-blind randomized control trial	use of honey and lemon in tea	Reduction of severity of POST	Recommended

Conclusions and recommendations

In this study, the literature has been reviewed and the factors impacting POST were addressed. This study showed that POST may

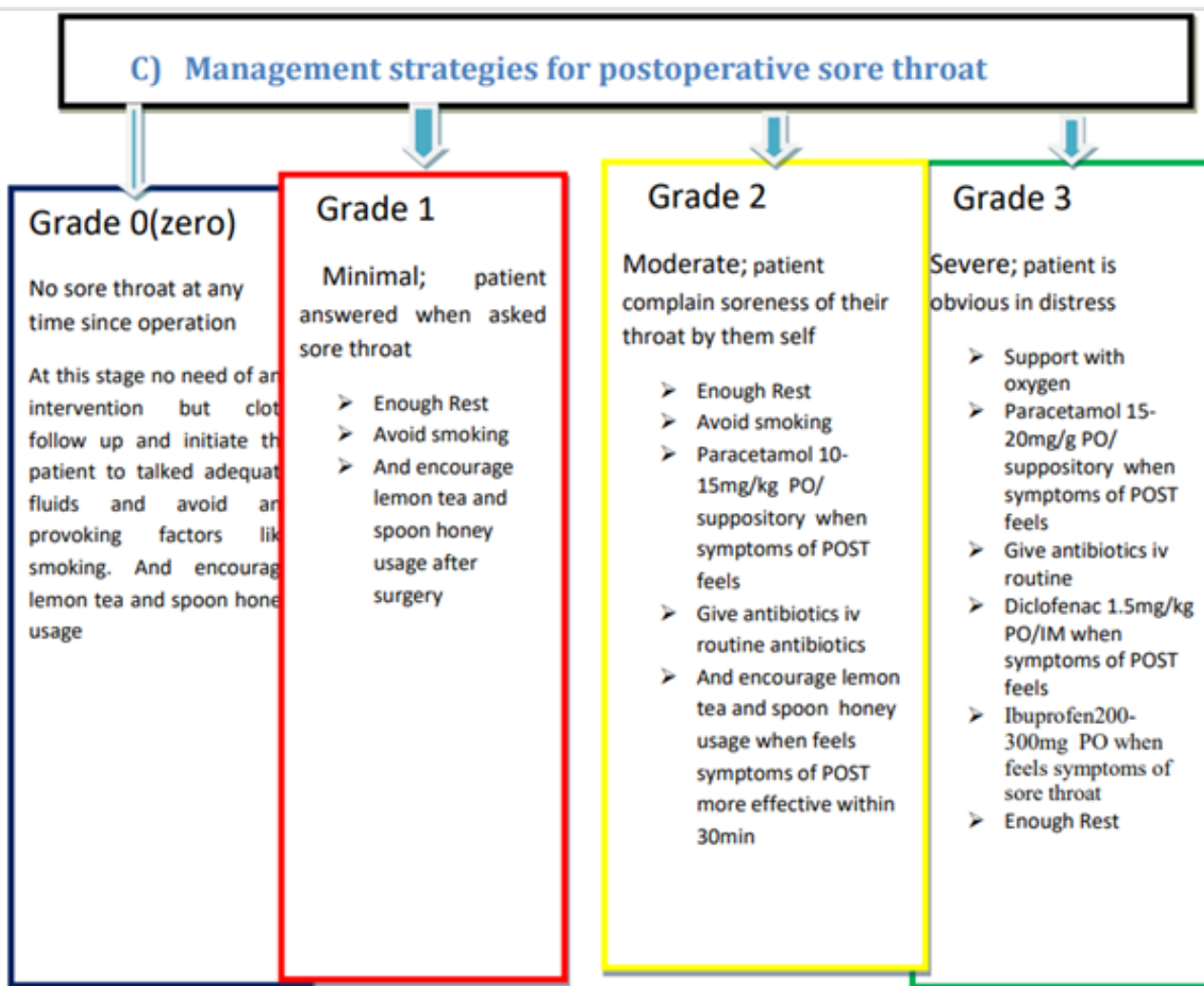
be linked to mental states like anxiety as well as to the most common patient characteristics, such as age, gender, and smoking. Anesthetists should act accordingly to minimize post-operative sore throat.

Guidelines for the risk stratification, prevention and management of postoperative sore throat



B) Prevention strategies for post-operative sore throat

Pharmacological	Non pharmacological
<ul style="list-style-type: none"> ➢ Use dexamethasone iv preoperative 0.13mg/kg or gargling 0.5mg/kg before intubation ➢ Use gargle of NMDA preoperative ,ketamine 50mg in 29ml of saline 5 min before intubation ➢ Avoid use of <u>suxamethonium</u> if no use non depolarizing relaxants ,lidocaine & mgso4 to avoid fasciculation ➢ Use lidocaine iv 1mg/kg preoperative better to avoid spray ➢ Inflation of cuff by lidocaine or saline to alkalization and basing ➢ Use NSAID alkalization of the cuff 	<p>If possible preside with regional anesthesia if not</p> <ol style="list-style-type: none"> First plan Use GA with face mask Second plan GA with LMA if so adequately lubricate and insert with inflation Use lowest possible size of cuffed ETT and monitored the cuff pressure <ul style="list-style-type: none"> ➢ Smooth suctioning ➢ Use HME filter to prevent dryness of mucus ➢ Good hands of <u>laryngoscopy</u> ➢ If possible avoid NGT



Ethical approval

Not required.

Sources of funding

None.

Author contribution

This work was carried out in collaboration among all authors. Atalay Eshetie Demilie and Endale Gebreegziabher Gbremedihin contributed to the conception of the review and interpreted the literatures based on the level of evidence and revised the manuscript. Yosef Belay Bizunch, Habtu Tsehayu Bayu and Zewditu Abdissa Denu participate in reviewing preparation of the manuscript. Both authors participate in preparation and critical review of the manuscripts. In addition, all authors read and approved the manuscript

Guarantor

Atalay Eshetie Demilie, Habtu Tsehayu Bayu, Zewditu Abdissa Denu, Yosef Belay Bizunch, Endale Gebreegziabher Gbremedihin

Acknowledgments

None.

Declaration of competing interest

The authors declare that there are no conflicts of interest.

References

1. Lee SH, Lee YC, Lee JH, et al. The prophylactic effect of dexamethasone on postoperative sore throat in prone position surgery. *Korean J Anesthesiol.* 2016;69(3):255–261.
2. Higgins P, Chung F, Mezei G. Postoperative sore throat after ambulatory surgery. *Br J Anaesth.* 2002;88(4):582–584.
3. Mayhood J, Cress K. Effectiveness of ketamine gargle in reducing postoperative sore throat in patients undergoing airway instrumentation: a systematic review. *JBI Evidence Synthesis.* 2015;13(9):244–278.
4. Kerdelmidis M, Lennon D, Arroll B, et al. Guidelines for sore throat management in New Zealand. *N Z Med J.* 2009;122(1301):10–18.
5. El-Boghdadly K, Bailey CR, Wiles MD. Postoperative sore throat: a systematic review. *Anaesthesia.* 2016;71(6):706–717.

6. Lee JY, Sim WS, Kim ES, et al. Incidence and risk factors of postoperative sore throat after endotracheal intubation in Korean patients. *J Int Med Res.* 2017;45(2):744–752.
7. Edomwonyi N, Ekwere I, Omo E, Rupasinghe A. Postoperative throat complications after tracheal intubation. *Ann African Medicine.* 2006;5(1):28–32.
8. 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. *International Journal of Surgery Open.* 2020;25:1–5.
9. 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, 2014. *Pan Afr Med J.* 2017;27:127.
10. Ahmed A, Abbasi S, Ghafoor HB, et al. Postoperative sore throat after elective surgical procedures. *J Ayub Med Coll.* 2007;19(2):12–14.
11. Mitobe Y, Yamaguchi Y, Baba Y, et al. A literature review of factors related to postoperative sore throat. *J Clin Med Res.* 2022;14(2):88–94.
12. McHardy FE, Chung F. Postoperative sore throat: cause, prevention and treatment. *Anaesthesia.* 1999;54(5):444–453.
13. Lam F, Lin YC, Tsai HC, et al. Effect of intracuff lidocaine on postoperative sore throat and the emergence phenomenon: a systematic review and meta-analysis of randomized controlled trials. *PLoS one.* 2015;10(8):e0136184.
14. Christensen A, Willemoes-Larsen H, Lundby L, et al. Postoperative throat complaints after tracheal intubation. *Br J Anaesth.* 1994;73(6):786–787.
15. Dutta A, Sethi N, Choudhary P, et al. The impact of tracheal-tube introducer guided intubation in anticipated non-difficult airway on postoperative sore throat: a randomized controlled trial. *Minerva Anesthesiol.* 2020;86(9):913–921.
16. Ahmed A, Abbasi S, Ghafoor HB, et al. Postoperative sore throat after elective surgical procedures. *J Ayub Med Coll Abbottabad.* 2007;19(2):12–14.
17. El-Boghdadly K, Bailey C, Wiles M. Postoperative sore throat: a systematic review. *Anaesthesia.* 2016;71(6):706–717.
18. McLachlan M, Gamble J, O'Brien JM, et al. Intracuff local anesthetic to reduce postoperative sore throat: a randomized clinical trial. *Can J Anesth.* 2020;67(4):495–497.
19. Shroff PP, Patil V. Efficacy of cuff inflation media to prevent postintubation-related emergence phenomenon: air, saline and alkalized lignocaine. *Eur J Anaesthesiol.* 2009;26(6):458–462.
20. Yang SS, Wang NN, Postonogova T, et al. Intravenous lidocaine to prevent postoperative airway complications in adults: a systematic review and meta-analysis. *Br J Anaesth.* 2020;124(3):314–323.
21. Thomson R. EndNote®. <http://www.endnote.com/>. 2020.
22. Liao CY, Ganz J, Vannest K, et al. PRISMA flow diagram of the search process. 2019.
23. Wong JGL, Heaney M, Chambers NA, et al. Impact of laryngeal mask airway cuff pressures on the incidence of sore throat in children. *Pediatric Anesth.* 2009;19(5):464–469.
24. Wang G, Qi Y, Wu L, et al. Comparative efficacy of 6 topical pharmacological agents for preventive interventions of postoperative sore throat after tracheal intubation: a systematic review and network meta-analysis. *Anesth Analg.* 2021;133(1):58–67.
25. Singh NP, Makkar JK, Wourms V, et al. Role of topical magnesium in post-operative sore throat: A systematic review and meta-analysis of randomised controlled trials. *Indian J Anaesth.* 2019;63(7):520–529.
26. Pelucchi C, Grigoryan L, Galeone C, et al. Guideline for the management of acute sore throat. *Clin Microbiol Infect.* 2012;18:1–28.
27. Singh NP, Makkar JK, Cappellani RB, et al. Efficacy of topical agents for prevention of postoperative sore throat after single lumen tracheal intubation: a Bayesian network meta-analysis. *Can J Anesth.* 2020;67(11):1624–1642.
28. Tanaka Y, Nakayama T, Nishimori M, et al. Lidocaine for preventing postoperative sore throat. *Cochrane database of systematic reviews.* 2015(7).
29. Tay JY, Tan WK, Chen FG, et al. Postoperative sore throat after routine oral surgery: influence of the presence of a pharyngeal pack. *Br J Oral Maxillofac Surg.* 2002;40(1):60–63.
30. Hayward G, Thompson M, Heneghan C, et al. Corticosteroids for pain relief in sore throat: systematic review and meta-analysis. *Bmj.* 2009;339:b2976.
31. Chang JE, Kim H, Han SH, et al. Effect of endotracheal tube cuff shape on postoperative sore throat after endotracheal intubation. *Anesth Analg.* 2017;125(4):1240–1245.
32. Choi E, Park Y, Jeon Y. Comparison of the cuff pressure of a Taper guard endotracheal tube and a cylindrical endotracheal tube after lateral rotation of head during middle ear surgery: a single-blind, randomized clinical consort study. *Medicine.* 2017;96(10):e6257.
33. Kim S. Comparison of the cuff pressures of a Taper Guard endotracheal tube during ipsilateral and contralateral rotation of the head: A randomized prospective study. *Medicine (Baltimore).* 2018;97(42):e12702.
34. De Orange FA, Andrade RG, Lemos A, et al. Cuffed versus uncuffed endotracheal tubes for general anaesthesia in children aged eight years and under. *Cochrane Database Syst Rev.* 2017;11(11):Cd011954.
35. Waruingi D, Mungayi V, Gisore E, et al. A randomised controlled trial of the effect of laryngeal mask airway manometry on postoperative sore throat in spontaneously breathing adult patients presenting for surgery at a university teaching hospital. *Afr Health Sci.* 2019;19(1):1705–1715.
36. Shi F, Xiao Y, Xiong W, et al. Cuffed versus uncuffed endotracheal tubes in children: a meta-analysis. *Journal of anesthesia.* 2016;30(1):3–11.
37. Obsa MS, Adem AO, Bancha B, et al. Global incidence and risk factors of post-operative sore throat among patients who underwent surgery: A Systematic Review and Meta-Analysis. *International Journal of Surgery Open.* 2022:100536.
38. Martin C, Perrin G, Gevaudan MJ, et al. Heat and moisture exchangers and vaporizing humidifiers in the intensive care unit. *Chest.* 1990;97(1):144–179.
39. Zhao X, Cao X, Li Q. Dexamethasone for the prevention of postoperative sore throat: a systematic review and meta-analysis. *J clin anesth.* 2015;27(1):45–50.
40. Winkel E, Knudsen J. Effect on the incidence of postoperative sore throat of 1 percent cinchocaine jelly for endotracheal intubation. *Anesth Analg.* 1971;50(1):92–94.
41. Wang G, Qi Y, Wu L, et al. Comparative efficacy of 6 topical pharmacological agents for preventive interventions of postoperative sore throat after tracheal intubation: A systematic review and network meta-analysis. *Anesth Analg.* 2021;133(1):58–67.
42. Nordin U, Lindholm CE, Wolgast M. Blood flow in the rabbit tracheal mucosa under normal conditions and under the influence of tracheal intubation. *Acta Anaesthol Scand.* 1977;21(2):81–94.
43. Furqan A, Fayyaz A, Ahmad SS, et al. Effect of applying lignocaine gel, diclofenac gel or their combination on endotracheal tube on the hemodynamic response and incidence of postoperative complications in patients undergoing CABG surgery. *Anaesth Pain & Intensive Care.* 2016;20(3):S32–S36.

44. Agarwal A, Gupta D, Yadav G, et al. An evaluation of the efficacy of licorice gargle for attenuating postoperative sore throat: a prospective, randomized, single-blind study. *Anesth Analg.* 2009;109(1):77–81.
45. Lee J, Park HP, Jeong MH, et al. Combined intraoperative paracetamol and preoperative dexamethasone reduces postoperative sore throat: a prospective randomized study. *J Anesth.* 2017;31(6):869–877.
46. Thomas M, Del Mar C, Glasziou P. How effective are treatments other than antibiotics for acute sore throat? *Br J Gen Pract.* 2000;50(459):817–820.
47. Titinchi F, Morkel JA, Ranchod S. Treatment of postoperative sore throat after endotracheal intubation in third molar surgery. *International Dentistry.* 2010;4(6):60–67.
48. Rajai N, Aryaeefar M, Pishgooie AH, et al. Effect of gargling with honey and lemon water on cough, sore throat, and hoarseness following endotracheal extubation: a clinical trial study. *Journal of Mazandaran University of Medical Sciences.* 2022;32(208):27–38.
49. Little P, Williamson I. Sore throat management in general practice. *Fam Pract.* 1996;13(3):317–321.
50. Watson N, Nimmo W, Christian J, et al. Relief of sore throat with the anti-inflammatory throat lozenge flurbiprofen 8.75 mg: a randomised, double-blind, placebo-controlled study of efficacy and safety. *Int J Clin Pract.* 2000;54(8):490–496..