The Egyptian Journal of Hospital Medicine (April 2022) Vol. 87, Page 1613-1618

Effect of Nebulized Dexamethasone versus Nebulized Ketamine on Postoperative Sore Throat after Thyroid Surgeries

Osama Eiad Mohamed Ben Sasi, Zainab Mostafa Attia,
Ali Mohmd Ali Hassn, Reham Mohamed Mohamed Aamer
Department of Anesthesia and Surgical Intensive Care, Faculty of Medicine Zagazig University, Egypt
***Corresponding author:** Osama Eiad Mohamed Ben Sasi, **Mobile:** (+20)01096181438, **E-mail:** osamabensasi1981@gmail.com

ABSTRACT
Background: Endotracheal intubation is the prominent cause of airway mucosal injury which results in postoperative sore throat (POST), with an incidence of 21%–65% if left unresolved, it produces significant agony and annoyance to the patient. **Objective:** The aim of the present study was to compare the hemodynamic effect of nebulized dexamethasone and nebulized ketamine on postoperative sore throat after thyroid surgeries. **Patients and methods:** This prospective controlled randomized double-blind study was carried out in Zagazig University Hospitals during the period from January to July 2021, included 72 patients of both gender in the age group 21-50 years, undergoing thyroidectomy under general anesthesia. **Results:** There was statistically significant increase of the severity and incidence of sore throat in the control groups immediately postoperatively, 2, 6, 12 and 24 hours postoperatively among the studied groups. While, there was significant difference between dexamethasone groups and ketamine group regarding the severity and incidence of sore throat immediatley, 2, and 6 hours (hr) postoperatively. **Conclusions**: We concluded that nebulized dexamethsone may be considered as a safe alternative to nebulized ketamine for decreasing POST.
Keywords: Dexamethasone, General anesthesia, Ketamine, Nebulization, Sore throat.

INTRODUCTION
Endotracheal intubation is the prominent cause of airway mucosal injury, which results in postoperative sore throat (POST), with an incidence of 21%–65% if left unresolved, it produces significant agony and annoyance to the patient[(1)].

Postoperative sore throat is common after thyroid surgery due to manipulation of the trachea during positioning, dissection of the gland and the neck being hyperextended leading to injury of the tracheal mucosa and vocal folds[(2)]. It is considered an important complication as it may increase incidence of postoperative morbidity as hoarseness of voice and dysphagia that cause patient dissatisfaction and discomfort. It may be unresolved for few days postoperatively and prolong hospital stay [(3)].

There are non-pharmacological methods to reduce postoperative sore throat as smaller sizes of tracheal tubes, careful airway manipulation, intubation after complete muscle relaxation, minimizing the number of laryngoscopy trials for intubation, fixation of endotracheal tube intra cuff pressure at or below 20 cm H_2O, gentle pharyngeal suctioning under vision and extubation when the tracheal tube cuff is fully deflated to avoid coughing during extubation[(4)]. The pharmacological methods used to reduce postoperative sore throat include use of beclomethasone gel, lidocaine spray, dexamethasone nebulizer and ketamine nebulizer and intravenous magnesium sulfate [(5)].

Steroids have anti-inflammatory functions and are widely used in common practice. The inhaled corticosteroids deliver the drug to the site of action where it is used in patients with airway diseases without systemic effects. Dexamethasone is a potent synthetic glucocorticoid with anti-inflammatory effects. It has been reported that dexamethasone is effective in the treatment of sore throat[(6)].

Ketamine, an N-methyl-d-aspartate (NMDA) receptor antagonist, has been used for decreasing postoperative sore throat because of its anti-nociceptive and anti-inflammatory action, as gargle as well as in nebulized form. However, nebulized ketamine is better tolerated in patients due to many reasons such as: It saves the patient from the bitter taste of ketamine, also much lesser volume is needed[(7)].

The aim of the present study was to compare the effectiveness of nebulized dexamethasone and nebulized ketamine on the incidence and severity of postoperative sore throat after thyroid surgeries.

PATIENTS AND METHODS
72 adult patients belonging to American Society of Anesthesiologists physical status I-II (ASA I-II) in the age group 21-50 years of both gender, undergoing thyroid surgery, were randomly divided into three equal groups using computer generated randomization table; **Group C**: Patients received normal saline (total volume of 5 ml) for nebulization**. Group D**: Patients received dexamethasone 8 mg (2 ml) with 3 ml of normal saline (total volume of 5 ml) for nebulization. **Group K**: Patients received ketamine (preservative-free) 50 mg (1 ml) with 4 ml of normal saline (total volume of 5 ml) for nebulization.

Exclusion criteria were uncooperative patients, history of allergic reaction to the study drugs, patients with chronic obstructive pulmonary disease, heavy smokers (20 packs/week), anticepated difficult intubation or Mallampati grade >2, History of preoperative upper respiratory tract infection, asthma, sore throat, recent use of nonsteroidal anti-inflammatory drugs, pregnant or breast feeding patient, operation lasting >2 hours in duration, patients of thyrotoxicosis or retrosternal extension.

Sample size:

Received: 30/10/2021
Accepted: 28/12/2021

Assuming that the incidence of postoperative sore throat (POST) in patients with dexamethasone was 10.0% vs. 28.0% in ketamine group at 80% power and 95% [(1)]. The sample size was estimated to be 72 cases (24 in each group) using open EPI program +10.0% dropped out.

Preoperative:

All parturient were visited in the ward, full history was taken, clinical examination of the patients, the anesthetic procedure was explained in details. Laboratory investigations included; Complete Blood Count (CBC), Coagulation profile, Thyroid profile (TSH, T3, T4). Liver function tests (LFT), Kidney function tests (KFT), Random blood sugar, Viral hepatitis marker. Electrocardiography "ECG" and X-ray chest. Patients' baseline heart rate (HR) and mean arterial pressure (MAP) were recorded. All patients were kept nil orally before the operation (8 hours for fatty meal, 6 hours for light meal and 2 hours for clear fluids).

Postoperative:

The incidence of postoperative sore throat (POST) was assessed by asking the patient for the presence or absence of soreness, pain, and change of voice or any discomfort in the throat at time 0, 2, 6, 12 and 24 hr. The severity of postoperative sore throat was assessed on a 4-point scale (0–3) assessed as per the following clinical scores: Grade 0 = no sore throat. Grade 1 = mild sore throat (complains of sore throat only on asking). Grade 2 = moderate sore throat (complains of sore throat on his/her own). Grade 3 = severe sore throat (change of voice or hoarseness, associated with throat pain).

Assessment for the patients for dysphagia was done using 4 point scale at time 0, 2, 6, 12 and 24 hr[(4,5)]: Grade 0 = no dysphagia. Grade 1 = minimal. Grade 2 =moderate. Grade 3 = severe.

These problems were evaluated just after extubation in the recovery room (0) zero time and then at 2, 6, 12 and 24 hr after surgery by a nurse blinded to the study [(4,5)] . Any side effects such as dry mouth, postoperative nausea and vomiting, and respiratory depression were noted and recorded during the first 24 hr postoperative.

Ethical consent:

An approval of the study was obtained from Zagazig University Academic and Ethical Committee. Every patient signed an informed written consent for acceptance of participation in the study. This work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Statistical analysis:

The collected data were coded, processed and analyzed using the SPSS (Statistical Package for the Social Sciences) version 22 for Windows® (IBM SPSS Inc, Chicago, IL, USA). Data were tested for normal distribution using the Shapiro Wilk test. Qualitative data were represented as frequencies and relative percentages. Chi square test (χ^2) was used to calculate difference between two or more groups of qualitative variables. Quantitative data were expressed as mean ± SD (Standard deviation) and were compared by one-way ANOVA test. P value < 0.05 was considered significant.

RESULTS

Table 1; there was no statistically significant difference regarding age, weight, height, body mass index (BMI), gender and ASA among the studied groups.

Table (1): Comparison of patients' characteristics among the studied groups

			Control group (N=24)	Dexamethasone group (N=24)	Ketamine group (N=24)	P
Age (year)			36.5 ± 8.94	38.29±7.27	35.25±9.47	0.473
Weight (kg)			75.29±7.2	74.71±7.69	76.13±7.17	0.799
Height (cm)			171.17±2.32	170.71±3.46	172.42±3.57	0.712
BMI (kg/m^2)			24.51±1.47	24.6±1.22	24.68±1.44	0.917
Duration of surgery (minute)			86.04±15.25	90.88±14.14	85.83±16.74	0.44
Intubation attempt: >2			0 (0)	0 (0)	0 (0)	1.00
Gender	**Female**	**N**	8	10	7	0.65
		%	33.3%	41.7%	29.2%	
	Male	**N**	16	14	17	
		%	66.7%	58.3%	70.8%	
ASA	**I**	**N**	15	17	17	0.77
		%	62.5%	70.8%	70.8%	
	II	**N**	9	7	7	
		%	37.5%	29.2%	29.2%	

Data were expressed as mean (±) standard deviation (SD), or Numbers (N), and percentage (%), BMI= (body mass index), ASA= (American Society of Anesthesiologists).

As regards intubation attempts and duration of surgery, there was no significant difference among the studied groups (Figure 1).

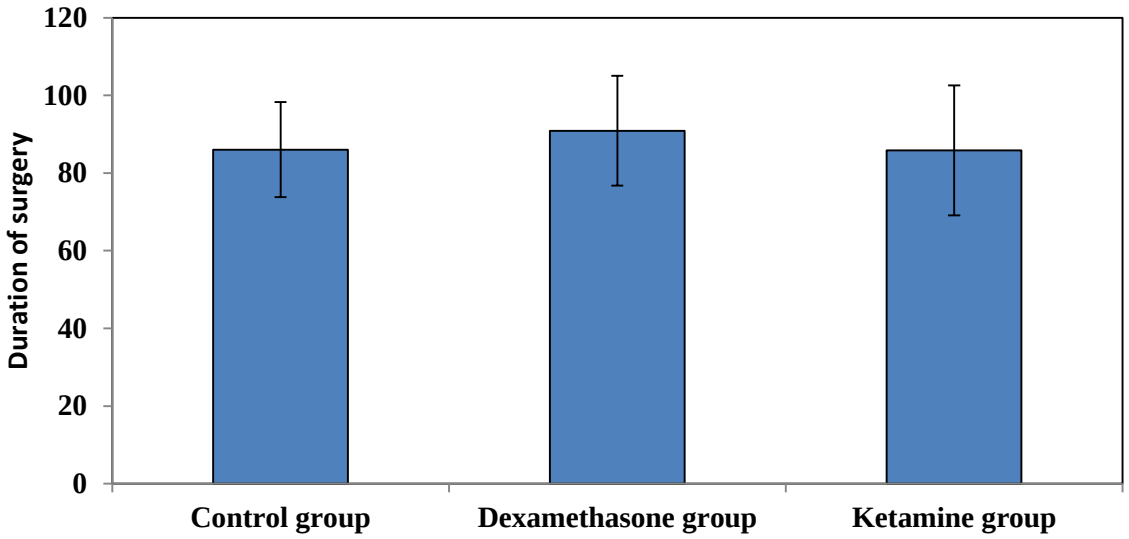

Figure (1): Duration of surgery among the studied group

Table 2 shows that there was no statistically significant difference regarding the mean heart rate at base line, before nebulization, pre induction, post induction at 15th, 30th, 45th, 60th minute, 75th minute, 90th minute intraoperatively and post extubation among the studied groups.

Table (2): Comparison of Heart Rate (HR) among the studied groups

Heart rate (b/m)	Control group (N=24)	Dexamethasone group (N=24)	Ketamine group (N=24)	P
Base line	76.54 ± 2.38	75.75 ± 1.26	75.83 ± 2.55	0.376
Before nebulization	74.54 ± 2.38	73.75 ± 1.26	74.13 ± 2.23	0.402
Pre induction	76.75 ± 3.62	76.25 ± 2.29	77.0 ± 2.27	0.641
Post induction	75.79 ± 5.28	74.83 ± 3.56	76.25 ± 2.36	0.44
15 minutes	75.67 ± 6.75	74.92 ± 5	77.71 ± 1.78	0.013
30 minutes	74.71 ± 6.81	75.96 ± 5.03	76.67 ± 1.71	0.039
45 minutes	74.67 ± 6.75	73.92 ± 5	76.5 ± 1.79	0.18
60 minutes	79.92 ± 5.9	78.83 ± 3.56	80.0 ± 2.27	0.563
75 minutes	75.71 ± 2.42	74.92 ± 1.25	75.13 ± 1.99	0.35
90 minutes	76.17 ± 2.37	74.93 ± 0.8	75.15 ± 1.81	0.164
Post extubation	77.0 ± 2.65	75.96 ± 1.2	76.46 ± 1.77	0.193

Data were expressed as mean (±) standard deviation (SD)

Table 3 shows that there was no statistically significant difference regarding mean arterial blood pressure at baseline, before nebulization, pre induction, post induction, at 15th, 30th, 45th, 60th minute, 75th minute, 90th minute intraoperative and post extubation among the studied groups.

Table (3): Comparison of the mean arterial blood pressure (MAP) among the studied groups

MAP	Control group (N=24)	Dexamethasone group (N=24)	Ketamine group (N=24)	P
Base line	62.0±4.57	62.17±5.05	62.25±4.95	0.984
Before nebulization	62.13±3.8	62.08±4.24	62.13±4.15	0.999
Pre induction	61.75 ± 3.79	62.79 ± 4.79	61.46 ± 3.8	0.508
Post induction	61.83 ± 4.91	62.46 ± 4.78	60.38 ± 4.21	0.287
15 minutes	62.04 ± 3.78	62.0 ± 4.79	61.46 ± 4.89	0.883
30 minutes	62.88 ± 3.35	64.92 ± 4.5	62.25 ± 4.5	0.114
45 minutes	62.88 ± 4.72	61.42 ± 3.89	60.58 ± 4.05	0.173
60 minutes	63.13 ± 4.56	63.67 ± 6.23	62.42 ± 5.35	0.488
75 minutes	63.29 ± 5.44	64.54 ± 6.6	62.54 ± 5.31	0.264
At 90 minutes	65.17 ± 5.15	66.2 ± 6.13	63.0 ± 4.68	0.727
Post-extubation	61.75 ± 3.12	60.96 ± 4.26	61.21 ± 3.87	0.76

Data were expressed as mean (±) standard deviation (SD), MAP= mean arterial pressure,

Figure 2; there was no statistically significant difference regarding oxygen saturation at baseline, before nebulization, pre induction, post induction then 15th, 30th, 45th, 60th, 75th , 90th minute intraoperatively and post extubation among the studied groups .

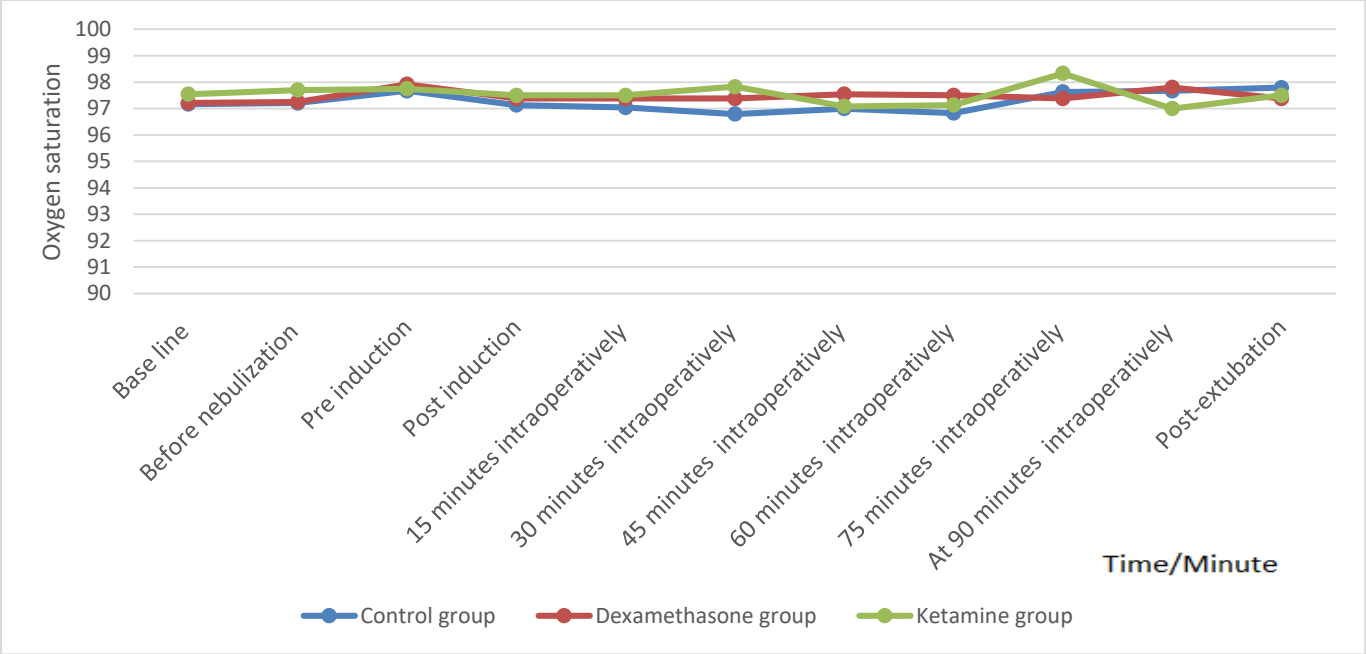

Figure (2): Oxygen saturation among the studied groups

Table 4 shows that there was a significant increase of the incidence of sore throat in the control groups immediately postoperatively then at 2, 6, 12, and 24 hr postoperatively compared to dexamethasone group and ketamine groups. There was a significant increase of the incidence of sore throat in the ketamine group compared to dexamethasone group immediately, 2, and 6 postoperatively. While, there was no significant difference between dexamethasone groups and ketamine group regarding sore throat 12 and 24 hr postoperatively.

Table (4): Comparison of the incidence of sore throat among the studied groups

Sore throat Incidence	Groups			P
	Control group (N=24)	Dexamethasone group (N=24)	Ketamine group (N=24)	
Immediately				
Absent	5 (20.8%)	19 (79.2%)	13(54.2%)	
Present	19 (79.2%)	5 (20.8%)	11 (45.8%)	<0.001**
P of Chi square	P_1=0.002**	P_2=0.05*	P_3 < 0.03*	
2 hours				
Absent	5 (20.8%)	19 (79.2%)	12 (50%)	
Present	19 (79.2%)	5 (20.8%)	12(50%)	0.001**
P of Chi square	P_1=0.003*	P_2 =0.03*	P_3 = 0.038*	
6 hours				
Absent	6 (25.0%)	20 (83.3%)	13 (53.2%)	
Present	18 (75.0%)	4 (16.7%)	11 (45.8%)	0.001**
P of Chi square	P_1=0.001*	P_2 =0,02*	P_3=0.017*	
12 hours				
Absent	12 (50.0%)	22 (91.7%)	19 (79.2%)	0.003*
Present	12 (50.0%)	2 (8.3%)	5 (20.8%)	
P of Chi square	P_1=0.0014*	P_2=0.41	P_3=0.03*	
24 hours				
Absent	14 (58.2%)	23 (95.8%)	22 (91.7%)	<0.001**
Present	10 (41.7%)	1 (4.2%)	2 (8.3%)	
P of Chi square	P_1=0.0019*	P_2=0.557	P_3= 0.007*	

Data were expressed as Numbers (N) and percentage (%), *: statistically significant, **: statistically highly significant, p1 the difference between control group and dexamethasone group, p2 the difference between ketamine group and dexamethasone group, P3 the difference between control group and ketamine group.

Table 5 shows that there was statistically significant increase of the severity of sore throat in the control groups immediately postoperatively, 2, 6, 12 and 24 hours postoperatively among the studied groups. There was a significant difference between dexamethasone groups and ketamine group regarding the severity of sore throat immediately, 2 and

6 hr postoperatively. While, there was no significant difference between dexamethasone groups and ketamine group regarding the severity of sore throat 12 and 24 hr postoperatively.

Table (5): Comparison of the severity of sore throat among the studied groups

Sore throat severity	Groups			
	Control group (N=24)	Dexamethasone group (N=24)	Ketamine group (N=24)	p
Immediately				
0	5 (20.8%)	19 (79.2%)	13 (54.2%)	
I	15 (62.5%)	5 (20.8%)	11 (45.8%)	<0.001**
II	4 (16.7%)	0 (0.0)	0 (0)	
III	0(0)	0(0.0)	0(0)	
P of Chi square	P_1=0.002**	P_2 =0.05*	P_3=0.031*	
2 hours				
0	5 (20.8%)	19 (79.2%)	12 (50.0%)	
I	15 (62.5%)	5 (20.8%)	12 (50.0%)	0.001**
II	4 (16.7%)	0 (0)	0 (0.0)	
III	0(0)	0(0)	0(0.0)	
P of Chi square	P_1= 0.008*	P_2 =0.03*	P_3 = 0.01*	
6 hours				
0	6 (25.0%)	20 (83.3%)	13 (79.2%)	
I	14 (58.2%)	4 (16.7%)	11 (20.2%)	0.001**
II	4 (16.7%)	0 (0.0)	0 (0)	
III	0 (0)	0 (0.0)	0 (0)	
P of Chi square	P_1=0.001*	P_2 = 0.02*	P_3= 0.016*	
12 hours				
0	12 (50%)	22 (91.7%)	19 (79.2%)	0.003*
I	12 (50%)	2 (8.3%)	5 (20.8%)	
II	0 (0)	0 (0)	0 (0)	
III	0 (0)	0 (0)	0 (0)	
P of Chi square	P_1=0.0014*	P_2 =0.41	P_3=0.03*	
24 hours				
0	14 (58.2%)	23 (95.8%)	22 (91.7%)	<0.001**
I	10 (41.7%)	1 (4.2%)	2 (8.3%)	
II	0 (0)	0 (0)	0 (0)	
III	0 (0)	0 (0)	0 (0)	
P of Chi square	P_1=0.0019*	P_2 =0.557	P_3=0.007*	

Data were expressed as Numbers (N), and percentage (%),*: statistically significant, **: statistically highly significant, p1 the difference between control group and dexamethasone group, p2 the difference between ketamine group and dexamethasone group, P3 the difference between control group and ketamine group

DISCUSSION

The present study was supported by the randomized, and double-blind study by **Kumari *et al.*** [8], which aimed to compare the efficacy of nebulized dexamethasone versus ketamine in preventing postoperative sore throat (POST). The study enrolled 100 patients aged between 20 and 60 years. Patients were randomized into two groups of 50 each; Group D: Patients received dexamethasone for nebulization and Group K: Patients received ketamine for nebulization.

Regarding the mean Heart Rate (HR) Mean Arterial Blood Pressure (MAP) and Oxygen Saturation (SPO_2) in this study, there was no statistical difference regarding the heart rate, mean blood pressure and oxygen saturation at base line, before nebulization, pre induction, at post-induction, 15-minute, 30-minute, 45-minute 60th minute, 75th minute, 90th minute intraoperatively and post extubation among the studied groups. This is in agreement with the study of **Shakya**[9] who aimed to compare the effects of nebulized ketamine on POST in patient undergoing general anesthesia. One hundred patients were randomized into two groups; group Saline (S) received nebulization with normal saline 5 ml and group Ketamine (K) received nebulization with ketamine of concentration 50 mg/ml mixed with 4 ml saline. There was no statistically significant difference regarding the heart rate, mean blood pressure and oxygen saturation between the groups.

Regarding the incidence of POST, this study revealed that there was statistically significant increase of the incidence of sore throat in the control groups immediately, postoperatively, then at 2 hr, 6 hr, 12 hr, and 24 hr postoperatively compared to dexamethasone

group and ketamine group. This is in agreement with the study of **Shakya** [9] who assessed sore throat in postoperative care unit, at 0 hr and then in ward every 2 hours for 8 hours and then at 24 hours . At 0 hr, many patients in saline group complained of sore throat but only a few patients in ketamine group complained of sore throat. The prevalence increased with time with peak at 4 hr in saline group and 6 hr in ketamine group. At 24 hour, patients in saline group still had sore throat but in ketamine group only few patient had sore throat. In contrast to the result of this study **Mostafa *et al.*** [1] reported that the incidence of POST at 4 hour after the operation was significantly less in the ketamine group than in the magnesium and dexamethasone groups. It was found that the peak incidence of POST was at 2 to 4 hours.

As regard the severity of POST, there was statistical significant difference between control group and both dexamethasone and ketamine groups immediately, 2, 6, 12 and 24 hours postoperatively among the studied groups. While the severity of sore throat was significant between dexamethasone group and ketamine groups at immediately, 2 hr, and 6 hr postoperatively. In agreement with these results **Thomas *et al.*** [10] reported that when comparing for the severity of POST between the dexamethasone and ketamine groups using a 4-point scale. POST was significantly abated in Dexamethasone Group at 2, 4, 6, and 12 hr postoperatively. When compared to Ketamine Group there was no significant difference in the severity of POST at 24 hr post-extubation. None of the patients experienced severe sore throat (POST Score 3) in both the groups.

CONCLUSIONS

We concluded that nebulized dexamethsone may be considered as a safe alternative to nebulized ketamine for decreasing POST. Future studies with bigger sample sizes are needed to strengthen our results.

Financial support and sponsorship: Nil.
Conflict of interest: Nil.

REFERENCES

1. **Mostafa E, Abdel Rahman A, Mahmoud M (2018):** Magnesium sulfate nebulizer versus ketamine nebulizer in decreasing incidence and severity of post operative sore throat with endotracheal intubation in adults. Egypt J Hosp Med., 73(8):7244–50.
2. **Mostafa R, Saleh A, Ibrahim I (2020):** The prophylactic effect of intravenous magnesium infusion on postoperative sore throat after thyroid surgery. A randomized clinical trial. Rev Chil Anest., 49:528–37.
3. **Higgins P, Chung F, Mezei G (2002):** Postoperative sore throat after ambulatory surgery. Br J Anaesth., 88(4):582–84.
4. **Ratnaraj J, Todorov A, McHugh T *et al.* (2002):** Effects of decreasing endotracheal tube cuff pressures during neck retraction for anterior cervical spine surgery. J Neurosurg Spine, 97(2):176–9.
5. **Zhao X, Cao X, Li Q (2015):** Dexamethasone for the prevention of postoperative sore throat: a systematic review and meta-analysis. J Clin Anesth., 27(1):45–50.
6. **Salama A, El-badawy A (2016):** Does nebulized dexamethasone decrease the incidence of postextubation sore throat?: a randomized controlled study. Ain-Shams J Anaesthesiol., 9(1):104–8.
7. **Thomas D, Bejoy R, Zabrin N *et al.* (2019):** Preoperative ketamine nebulization attenuates the incidence and severity of postoperative sore throat: A randomized controlled clinical trial. Saudi J Anaesth., 12(3):440–6.
8. **Kumari S, Bhashyam S, Lakshmi B (2019):** Effects of nebulized dexamethasone versus nebulized ketamine on the attenuation of post-operative sore throat following endotracheal intubation. International Journal of Scientific Study, 7(9): 10-15.
9. **Shakya B (2020):** Effect of preoperative nebulized ketamine on incidence and severity of postoperative sore throat in patient undergoing general anaesthesia with endotracheal intubation. Journal of Institute of Medicine Nepal, 42(1): 12-16.
10. **Thomas D, Chacko L, Raphael P (2020):** Dexmedetomidine nebulisation attenuates post-operative sore throat in patients undergoing thyroidectomy: A randomised, double-blind, comparative study with nebulised ketamine. Indian Journal of Anaesthesia, 64(10): 863-67.