

# Comparison Of Prophylactic Effects Of Gargling Different Doses Of Ketamine On Attenuating Post-Operative Sore Throat.

Dr. Anjali Kurup, Dr T.N. Srikantamurthy, Dr Kodanda Ram N.S

Junior Resident, Professor And Hod, Professor, Department Of Anaesthesiology, Akash Institute Of Medical Sciences And Research Centre.

## Abstract

*Aims and objectives:* The aim of the study is to evaluate effectiveness of two doses of ketamine gargle in preventing post-operative sore throat (POST).

*Materials & Method:* Sixty-nine patients scheduled for elective surgery under general anaesthesia were randomized into three groups: Group C, saline 30 ml; Group A, ketamine 100 mg in Saline 30 ml and Group, ketamine 120 mg in saline 30ml. Patients were asked to gargle this mixture for 30 seconds, 5 minutes before induction of anaesthesia. POST was graded at 4, 8 and 24 hours after operation on a four-point scale (0-3). The primary outcome of incidence and grading of POST along with secondary outcomes of drug-related adverse effects were observed and recorded.

*Results:* In the Control group POST occurred more frequently, when compared with patients belonging to both the Ketamine groups at 4, 8, and 24 hours (74%, 70%, and 52%). The greatest difference in the severity of POST was observed at the 4-hour and 8-hour intervals in both the 100 mg and 120 mg ketamine groups. However, these groups exhibited similar outcomes at the 24-hour mark ( $p < 0.05$ ).

*Conclusion:* Prophylactic intravenous Glycopyrrolate in spinal anaesthesia for cesarean section reduces the incidence and severity of hypotension and the need for Vasopressor.

**Keywords:** Sore throat; Intubation; Ketamine gargle.

Date of Submission: 24-09-2024

Date of Acceptance: 04-10-2024

## I. Introduction

Postoperative sore throat (POST) is a frequent complication following general anesthesia, particularly when endotracheal intubation is used. Its incidence varies significantly based on several factors, including the type of airway management, tube size, cuff pressure, and patient-related factors such as gender and surgical procedure. Studies report that patients with endotracheal tubes (ETT) have the highest incidence of POST, with approximately 45% of these patients experiencing sore throat, compared to 17.5% for those using laryngeal mask airways (LMA) and only 3.3% with face masks (FM). Female patients and those undergoing gynecological surgeries are also at higher risk for POST (1).

Pharmacological and non-pharmacological strategies have both been utilized effectively to manage and prevent postoperative sore throat (POST). Among pharmacological interventions, **corticosteroids** like dexamethasone are widely used for their anti-inflammatory properties, which reduce mucosal edema and minimize POST incidence. **Ketamine gargles**, leveraging ketamine's anti-inflammatory and analgesic effects, through its action on NMDA receptors, have also shown promise in clinical trials by reducing POST through lowering mucosal irritation. Similarly, **magnesium sulfate**—administered as a nebulized agent before surgery—has demonstrated efficacy due to its NMDA receptor antagonism, which blocks calcium channels and reduces nociceptive responses. Another agent, **lidocaine**, applied topically or as a gargle, helps numb the airway and mitigate irritation, while **benzylamine hydrochloride**, used on the endotracheal tube cuff or oropharynx, reduces POST via local anesthetic effects on the mucosa.

Non-pharmacological methods are equally important. Using **smaller endotracheal tubes** and maintaining minimal **cuff pressure** can prevent mucosal trauma, significantly lowering the likelihood of POST. **Laryngeal mask airways (LMAs)**, a less invasive alternative to endotracheal tubes, have been associated with a lower POST incidence. Moreover, ensuring **adequate hydration** and using **humidified oxygen** after extubation help reduce dryness and throat irritation, thus alleviating POST symptoms (2).

Several studies have showed that N-methyl-D-aspartate receptor (NMDA) receptors are not only found in CNS for example the term CNS will likely not be repeated so this can be out in full but also in the peripheral

nerves (3). Therefore, administration of ketamine may actually contribute to relieve post-operative sore throat (POST) with no major systemic effects.

This study aims to compare the effectiveness of different doses of Ketamine gargles with a placebo in preventing POST after oral endotracheal intubation.

## II. Aims And Objectives

The aim of the study is to evaluate effectiveness of two doses of ketamine gargle in preventing post-operative sore throat (POST).

## III. Materials & Method

A prospective, randomized comparative study was conducted on 69 patients scheduled for elective surgeries, excluding ENT procedures, under general anesthesia with endotracheal intubation at the Department of Anaesthesiology, Akash Institute of Medical Sciences and Research Centre, between May and July 2023. Approval was obtained from the institutional ethics committee, and informed patient consent was secured prior to enrollment. The sample size was calculated using the formula  $1 + Z^2 \times P(1-P)/e^2N$ , where N represented the population size, e the margin of error, Z the Z-score, and P the standard deviation.

Patients included in the study were between 18 and 55 years old, belonged to ASA physical status I or II, and had a body mass index (BMI) between 19 and 30 kg/m<sup>2</sup>. Exclusion criteria involved patients with significant cardiac, pulmonary, or cerebrovascular conditions, coagulopathies, local infections, severe spinal deformities, or other contraindications to spinal anesthesia. Additionally, patients with known hypersensitivity to the study medications were excluded.

All selected patients were premedicated with intravenous Ranitidine (50 mg) and Ondansetron (4 mg). The participants were randomly divided into three groups using the sealed envelope method. Group C received 30 ml of saline, while Groups A and B were administered 100 mg and 120 mg of ketamine, respectively, mixed in 30 ml of saline. Each patient was instructed to gargle for 30 seconds, five minutes before entering the operating room.

Anesthesia induction was achieved with 2 mg/kg of Propofol, and tracheal intubation was facilitated using Vecuronium bromide (0.1 mg/kg). Standard-sized polyvinyl chloride endotracheal tubes (7–8 mm for women, 8–9 mm for men) with cuffed seals were utilized. Experienced anesthesiologists performed the intubations, and patients who required multiple intubation attempts were excluded. Continuous monitoring was conducted, including ECG, heart rate (HR), blood pressure (BP), oxygen saturation (SpO<sub>2</sub>), and mean arterial pressure (MAP).

Maintenance of anesthesia was achieved using a mixture of oxygen (33%) and nitrous oxide, supplemented with Isoflurane. Tracheal tube cuffs were inflated to prevent air leakage. Upon completion of the surgery, residual neuromuscular blockade from Vecuronium was reversed with Neostigmine and Glycopyrrolate. Oropharyngeal suctioning was performed under direct vision before extubation to prevent trauma and ensure secretion clearance.

Postoperative sore throat (POST) was assessed at 4, 8, and 24 hours post-extubation using a standard four-point grading scale: 0, no sore throat; 1, mild sore throat (reported only when asked); 2, moderate sore throat (reported spontaneously); and 3, severe sore throat (hoarseness or pain). Any additional side effects were also recorded. Data were analyzed using SPSS software version 22.0, with means and standard deviations calculated for all parameters. Statistical significance was determined using the Chi-square test, with a p-value of less than 0.05 considered significant.

## IV. Results

**Table 1: Patient characteristics and data related to the surgery. Data are given as mean (range), mean (sd) or absolute numbers.**

Parameters	Group C	Group A	Group B	P value
Mean Age (years)	28 ± 2.10	29 ± 2.12	28 ± 2.20	0.34
Mean Height (cm)	151	152	154	0.13
Mean Weight (kg)	67 ± 6.2	65 ± 6.12	66 ± 6.22	0.53
BMI (kg/m <sup>2</sup> )	28.9	28.4	28.5	0.604
Duration of Surgery (minutes)	95	93	100	0.66
Time taken for endotracheal intubation (seconds)	86	82	90	0.54

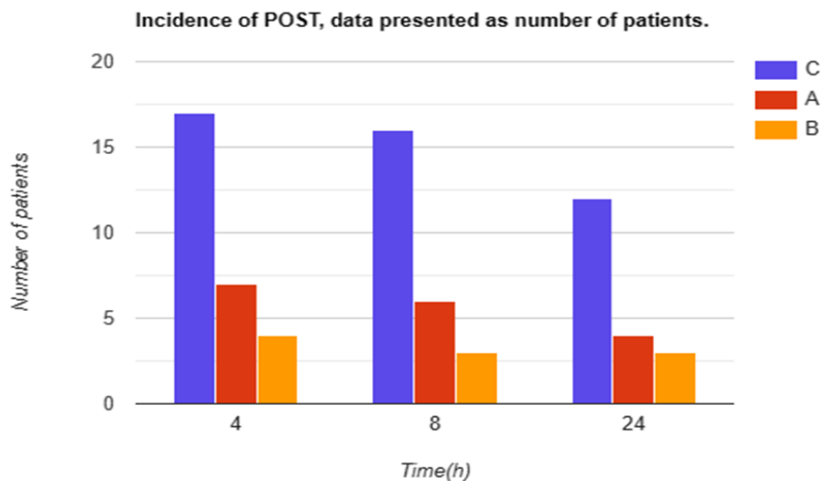
It was found that there were no significant variations between the groups with respect to age, weight, duration of surgery or anaesthesia (Table 1).

**Table 2: Severity of POST in control (C) and ketamine (A and B) groups. Data are presented as number of patients.**

Groups	4h			8h			24h			P value
	C	A	B	C	A	B	C	A	B	
Grading of discomfort										
None	6	16	19	17	17	20	11	19	20	<0.05
Mild	4	6	3	1	5	2	4	4	3	<0.05
Moderate	10	1	1	10	1	1	1	0	0	<0.05
Severe	3	0	0	5	0	0	3	0	0	<0.05

Severity of POST was significantly lower in both Ketamine groups than in Control group,  $P < 0.05$ . Overall, the patients in Control group had significantly more incidence of POST at 4, 8 and 24 hours (74%, 70%, and 52%) than in patients having ketamine gargle,  $P < 0.05$ . No local or systemic side effects were observed.

The difference in severity of POST was maximum during 4h and 8h intervals in 100mg and 120mg Ketamine groups. These groups showed similar results at 24h mark.



**Fig 1: Incidence of POST, data presented as number of patients. \* $P < 0.05$  during comparison between control (C) vs ketamine (A and B) groups.**

### V. Discussion

Our study demonstrated a significant reduction in the incidence of postoperative sore throat (POST) after preoperative gargling with ketamine compared to saline, with the reduction being more pronounced in patients receiving higher doses of ketamine. This suggests that ketamine's analgesic and anti-inflammatory properties are effective in mitigating POST in patients undergoing surgery under general anesthesia.

Several factors are known to contribute to POST, including patient sex, age, the use of succinylcholine, the size and design of the tracheal tube, and cuff pressure. However, our findings did not show any correlation between POST and variables such as age, gender, surgery duration, or intubation characteristics. This indicates that while these factors may play a role in other settings, they were not significant in our study cohort (4).

Recent studies have highlighted ketamine's potential protective effects against lung injury due to its anti-inflammatory characteristics. In a rat model of sepsis induced by lipopolysaccharide (LPS), ketamine was shown to reduce endotoxemia by lowering TNF-alpha production and reducing the expression of inducible nitric oxide synthase (iNOS). These findings align with ketamine's broader anti-inflammatory effects, making it a promising agent for reducing POST (5).

Zhu and colleagues conducted an animal study on asthma, showing that nebulized ketamine could attenuate central inflammatory changes. Given these protective effects, ketamine gargle has emerged as a promising intervention to reduce the incidence and severity of POST due to its anti-inflammatory properties. Moreover, studies exploring the nasal, oral, and rectal administration of ketamine suggest its feasibility and effectiveness as a local treatment for inflammation (6).

One limitation of our study is that we did not measure plasma ketamine levels, making it difficult to exclude the potential influence of systemic effects of ketamine on our results. As such, the reduction in POST could be due to either the topical or systemic anti-inflammatory and analgesic properties of ketamine.

Additionally, our study explored the use of higher doses of ketamine in gargles, which have not been extensively researched in previous studies. This opens new avenues for further research into the optimal dosing and administration of ketamine for the prevention of POST.

## **VI. Conclusion**

To summarize, the utilization of ketamine gargle led to a reduction in both the occurrence and severity of postoperative sore throat (POST) in patients undergoing surgery under general anesthesia.

## **References**

- [1] Higgins Pp, Chung F, Mezei G. Postoperative Sore Throat After Ambulatory Surgery. *Br J Anaesth*. 2002 Apr 1;88(4):582-4.
- [2] Huang Ys, Et Al. The Effectiveness Of Benzylamine Hydrochloride Spraying On The Endotracheal Tube Cuff Or Oral Mucosa For Postoperative Sore Throat. *Anesthesia & Analgesia*. 2010;111:887-891.
- [3] Carlton Sm, Coggeshall Re. Inflammation-Induced Changes In Peripheral Glutamate Receptor Populations. *Brain Res*. 1999; 820: 63-70.
- [4] Stout Dm, Bishop Mj, Dwersteg Jf, Cullen Bf, Correlation Of Endotracheal Tube Size With Sore Throat And Hoarseness Following General Anesthesia. *Anesthesiology*. 1987; 67: 419-42.
- [5] Sun J, Li F, Chen J, Xu J. Effect Of Ketamine On Nf-Kappa B Activity And Tnf-Alpha Production In Endotoxin-Treated Rats. *Ann Clin Lab Sci*. 2004; 34: 181-186.
- [6] Zhu Mm, Qian Yn, Zhu W Et Al. Protective Effects Of Ketamine On Allergen-Induced Airway Inflammatory Injure And High Airway Reactivity In Asthma: Experiment With Rats. *Zhonghua Yi Xue Za Zhi*. 2007; 87: 1308-1313.