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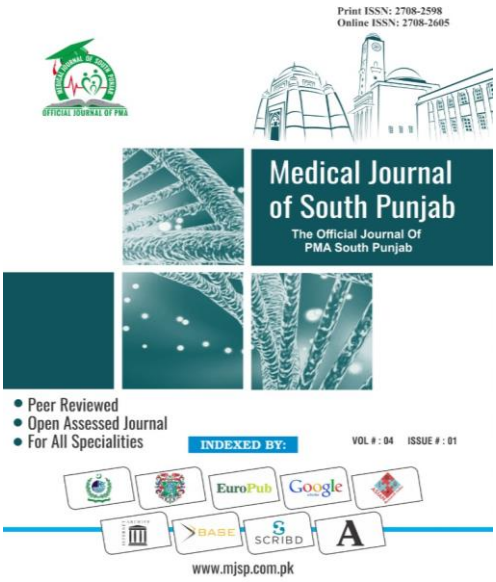

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Original Article

Comparison of ketamine nebulisation with ketamine gargle in attenuating postoperative sore throat

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ABSTRACT

Objective: *to compare the effectiveness of ketamine nebulisation versus ketamine gargle in reducing the incidence and severity of postoperative sore throat (POST).*

Methods: *A prospective randomized study conducted at Mayo Hospital Lahore from December 2022 to November 2023, lasting for one-year duration. patients were randomly assigned into two groups, Group GK and Group NK, each comprising 45 individuals, using computer-generated random number tables. These tables were enclosed in opaque envelopes prepared by an anesthesiologist not directly involved in the study.*

Results: *Mild sore throat occurred in GK group at 0, 2, 4, and 24 hours post-op at 4.4%, 4.4%, 6.7%, and 4.4%, respectively. In Group NK, it was 6.7%, 8.9%, 8.9%, and 6.7% at the same intervals. Moderate sore throat in GK was 6.7%, 2.2%, 2.2%, and 0%, and in NK was 2.2%, 6.7%, 0%, and 0%. The difference in sore throat severity between groups was statistically insignificant ($p > 0.050$).*

Conclusion: *Ketamine nebulisation is widely accepted by all patients and has proven effective in reducing the incidence and severity of postoperative sore throat (POST) during the early recovery period, providing valuable assistance to anaesthetists in managing this common issue.*

Keywords: *Gargles, Ketamine, Nebulisation, Post-operative sore throat, General Anesthesia.*

1. INTRODUCTION

American anaesthesiologists rank post-operative sore throat (POST) as the 8th most undesirable subjective complaint after general anaesthesia[1], with an incidence ranging from 21-65%. POST is attributed to mucosal injury in the trachea[2], exacerbated by factors such as oropharyngeal suctioning, intra-cuff pressure, throat pack usage, endotracheal tube size, surgery duration, and difficult intubation[3], all contributing as risk factors. Numerous studies have investigated non-pharmacological and pharmacological interventions to mitigate POST, yielding varied success rates[4].

Ketamine is a noncompetitive antagonist of the N-methyl-D-aspartate (NMDA) receptor, which is a type of glutamate receptor[5]. By blocking NMDA receptors, ketamine inhibits the excitatory effects of glutamate, leading to a reduction in neuronal activity. This mechanism is thought to contribute to ketamine's anesthetic and analgesic effects[6].

Ketamine, primarily known as a dissociative anesthetic agent, has garnered interest in recent years due to its potential role in attenuating postoperative sore throat (POST)[7]. POST is a common complaint following endotracheal intubation during surgery, with reported incidence rates ranging from 21% to 65%[8]. It can lead to patient discomfort, dissatisfaction, and delayed recovery. The mechanisms underlying POST involve various factors such as mucosal irritation, inflammation, and trauma during intubation. Ketamine's pharmacological properties make it a candidate for mitigating POST through several mechanisms[9].

The study intends to compare the incidence and severity of postoperative sore throat (POST) between ketamine gargle and ketamine nebulisation, as previous research has highlighted the efficacy of ketamine gargle in reduction of sore throat, despite concerns over aspiration risk and unpleasant taste, while nebulisation offers an alternative method to deliver ketamine without the bitter taste and large volume associated with gargling[9].

2. METHODOLOGY

A prospective randomized study conducted at Mayo Hospital Lahore from December 2022 to November 2023, lasting for one-year duration, with approval from the Institutional Ethical Committee, involved 90 ASA physical status I and II patients aged between 20 to 60 years, encompassing both sexes, undergoing elective surgeries under general anesthesia in a supine position for up to 2 hours, with written informed consent obtained. Exclusion criteria included a history of smoking, asthma, COPD, use NSAIDs, pre-operative sore throat, Mallampatti grade exceeding 2, requiring more than one intubation attempt, and an intubation time exceeding 20 seconds.

Pre-operative anesthesia fitness and examination was conducted one day before surgery, premedication of patients was done with 10 mg of oral diazepam at night. Subsequently, the patients were randomly assigned into two groups, Group GK and Group NK, each comprising 45 individuals, using computer-generated random number tables. These tables were enclosed in opaque envelopes prepared by an anesthesiologist not directly involved in the study.

In Group GK, patients were given solution of ketamine containing 50 mg in 1ml diluted in 29ml of normal saline for gargles. They were instructed to gargle for 30 seconds, divided into two parts, to reduce the risk of swallowing the large volume. Conversely, in NK group, patients were given 50mg ketamine in 1ml dilution in 4ml of normal

saline for nebulisation over a 15-minute duration from central oxygen source.

In a study where patients couldn't be blinded due to differing administration routes, anesthesia was uniformly induced after 5 minutes with standard monitoring equipment including ECG, Pulse Oximeter, and non-invasive blood pressure. Preoxygenation with 100% oxygen for 3 minutes and premedication with injection glycopyrolate 4µg/kg and injection midazolam 0.03mg/kg were administered. Anesthesia induction was given fentanyl 2µg/kg injection and propofol injection 2mg/kg, and then tracheal intubation facilitated by 0.1mg/kg vecuronium bromide. Maintenance involved halothane and 33% oxygen in air supplement, while cuff pressure was maintained between 20-22 cm of water and peak airway pressure was kept below 25cm of water. Intraoperative analgesia was supplemented with injection fentanyl, and prophylactic medications injection ondansetron 4mg and injection dexamethasone 8mg were given 30 minutes before surgery completion. Postoperatively, the oropharynx was suctioned under visualization, halothane was stopped, and O2 concentration increased to 100%. Neuromuscular blockade was reversed with injection neostigmine 50µg/kg and injection glycopyrrolate 10µg/kg. Patients extubated as per-extubation protocol, with those exhibiting coughing or bucking during extubation. Patients were given 1g paracetamol for pain control.

Patients were interviewed for sore throat upon arrival to the post-operative room (0 hr) and subsequently at the 2nd, 4th, and 24th hours post-operation by a blinded investigator. The severity of post-operative sore throat (POST) was assessed using a four-point scale (0-3), where 0 indicated no sore throat, 1 denoted mild sore throat (patients reported soreness upon inquiry), 2 indicated moderate sore throat (patients spontaneously complained of soreness), and 3 signified severe sore throat accompanied by hoarseness of voice.

SPSS version 27 was used for data analysis and p values after test of significant p value 0.05 was considered as significant.

3. RESULTS

The total patients in this study were 90, 40 patients were included in gargled Ketamine (GK Group) and 40 were included in nebulisation (Group NK). The distribution of gender, age, weight and duration of anesthesia in both the groups were almost equal, (p: >0.050). (Table. I).

Mild sore throat at post-operative at 0, 2, 4 and 24 hours in GK group was 2 (4.4%), 2 (4.4%), 3 (6.7%) and 2 (4.4%), respectively. Whereas, sore throat was mild at 0, 2, 4 and 24 hours in Group NK was 3 (6.7%), 4 (8.9%), 4 (8.9), and 3 (6.7%), respectively. The sore throat was moderate at 0, 2, 4 and 24 hours in Group GK was 3 (6.7%), 1 (2.2%), 1 (2.2%) and 0 (0.0%), respectively. Whereas, the sore throat was moderate at 0, 2, 4 and 24 hours in Group NK was 1 (2.2%), 3 (6.7%), 0 (0.0%) and 0 (0.0%), respectively. Further, severity of throat at post-operative between the groups (p: >0.050). (Table. II).

Table-I: Demographic profile of the groups

	Group GK n=45	**Group NK n=45**	**p-value**
Gender			
Male	28 (62.2)	24 (53.3)	0.393
Female	17 (37.8)	21 (46.7)	
Age (years)	43.95±8.48	47.08±7.01	0.059
Weight (kg)	64.91±6.11	63.55±5.38	0.272
Duration of anesthesia (minutes)	125.71±6.01	127.42±7.71	0.244
Mean±S.D, N (%)			

Table. II: Severity of sore throat at post-operative between the groups

Sore throat	0 hour		2 hours		4 hours		24 hours	
	Group GK n=45	Group NK n=45	Group GK n=45	Group NK n=45	Group GK n=45	Group NK n=45	Group GK n=45	Group NK n=45
No	40 (88.9)	41 (91.1)	42 (93.3)	38 (84.4)	41 (91.1)	41 (91.1)	43 (95.5)	42 (93.3)
Mild	2 (4.4)	3 (6.7)	2 (4.4)	4 (8.9)	3 (6.7)	4 (8.9)	2 (4.4)	3 (6.7)
Moderate	3 (6.7)	1 (2.2)	1 (2.2)	3 (6.7)	1 (2.2)	0 (0.0)	0 (0.0)	0 (0.0)
Severe	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
p-value	0.545		0.393		0.565		0.764	

4. DISCUSSION

Post-operative sore throat, often a consequence of general anesthesia, is a prevalent complication that significantly adds to postoperative morbidity among patients and prolong hospital stay. Mild sore throat at post-operative at 24 hours in GK group was 4.4%. Whereas, sore throat was mild at 24 hours in Group NK was 6.7%. Higgins et al[10] reported that experiencing postoperative sore throat (POST) not only causes discomfort to the patient but also prolongs the post-operative stay by 14 minutes compared to individuals who did not complain of POST.

In this study majority of patients were male in both groups 62.2% and 53.3%, and mean age was 43.95±8.48 and 47.08±7.01 years. But a contrast observation was found in study conducted by Amingad et al[11] female gender was higher in ration as compare to male, mean age was 40.18±10.93 years and 47.08±7.01 years in gargles ketamine and ketamine nebulisation respectively (p value 0.059).

The attribution of postoperative sore throat (POST) appears to vary according to different studies, with Jaensson et al[12] suggesting a higher prevalence among younger individuals, whereas Ahmed et al[13] research indicates a greater occurrence among the elderly. This disparity underscores the complex interplay of age-related factors in the manifestation of POST, potentially influenced by anatomical differences, physiological changes, and varying responses to anesthesia and intubation procedures across different age groups.

Studies conducted by Canbay et al[14] and Rudra et al[15] revealed a significant reduction of over 50% in the incidence of sore throat compared to the previously reported rates ranging from 21% to 65%. Our study aligns with numerous other investigations demonstrating a decrease in the incidence of postoperative sore throat (POST).

In the study conducted by Modak et al[16], investigating the incidence of postoperative sore throat (POST), it was found that in the gabapentin (GK) group, the occurrence rates at 0, 2, 4, and 24 hours post-surgery were 27%, 25%, 20%, and 17% respectively. Conversely, in the non-gabapentin (NK) group, the incidence rates were slightly lower, with values of 20%, 17.5%, 12.5%, and 7.5% for the same time intervals. Despite these variations, statistical analysis did not reveal a significant difference between the two groups, suggesting that the administration of gabapentin did not substantially impact the likelihood of experiencing postoperative sore throat compared to the non-gabapentin group. Furthermore, it's noteworthy that no patients in either group reported experiencing severe sore throat, indicating that the overall severity of this postoperative complication was limited in the studied population.

Mean duration of anesthesia in GK group was 125.71±6.01 and 127.42±7.71 min in NK group. Ahuja et al17 discovered that opting for nebulized ketamine over oral, intravenous, or gargle forms primarily aimed at ensuring safety and facilitating ease of

administration to patients in the immediate pre-operative period, suggesting that aerosol deposition in the mouth and upper airway likely reduces post-operative sore throat (POST) through the topical analgesic effect of nebulized ketamine18.

These findings are consistent with Chan et al[19] study, which assessed intra-operative serum ketamine levels and proposed a topical effect of ketamine in reducing postoperative sore throat (POST), given the minimal systemic absorption indicated by the low levels of serum ketamine detected. In their study, Mostafa et al[20] compared the effects of ketamine, magnesium sulfate, and dexamethasone, revealing that the peak incidence of postoperative sore throat (POST) occurred between 2-4 hours' post-surgery. Furthermore, they found that at the 4-hour mark, the ketamine group exhibited a significantly lower incidence of POST compared to both the magnesium sulfate and dexamethasone groups.

5. CONCLUSION

Ketamine nebulisation is widely accepted by all patients and has proven effective in reducing the incidence and severity of postoperative sore throat (POST) during the early recovery period, providing valuable assistance to anaesthetists in managing this common issue.

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