Open Access

Original Article

Comparison of Preoperative Ketamine Nebulization versus Saline Nebulization in Decreasing the frequency and Severity of Postoperative Sore Throat

Muhammad Zeeshan Akbar, Naveed Farhat, Abdul Hameed Bhatti*, Kenan Anwar Khan, Abdul Raafeh Jamal***, Muhammad Muzzamil Saleem******

Department of Anesthesia, Combined Military Hospital, Bahawalpur/National University of Medical Sciences (NUMS) Pakistan, *Department of Anesthesia, Pakistan Air Force Hospital, Islamabad Pakistan, **Department of Anesthesia, Pakistan Navy Ship Shifa Hospital, Karachi Pakistan, ***Department of Anesthesia, Combined Military Hospital/National University of Medical Sciences (NUMS) Rawalpindi Pakistan, ****Department of Anesthesia, Pak Emirates Military Hospital/National University of Medical Sciences (NUMS) Rawalpindi Pakistan

ABSTRACT

Objective: To compare preoperative Ketamine nebulization versus saline nebulization in reducing the frequency and severity of sore throat postoperatively.

Study Design: Quasi-experimental study.

Place and Duration of Study: Department of Anesthesia, Combined Military Hospital, Bahawalpur Pakistan, from Jan to Jun 2022.

Methodology: A total of 120 patients (60 in each group) with different surgeries filling the inclusion criteria were considered in the study. Adult patients of 20-60 years with ASA class 1-2 who were planned for elective surgery of less than 2 hours were included. Group-A patients underwent nebulization with Ketamine while in Group-B nebulization was done with normal saline.

Results: A total of patients included were 120 (60 each group). Twenty-eight (23.3%) patients developed Post-Operative Sore Throat at some time after extubation. The frequency of Post-Operative Sore Throat with Ketamine was 13.3% and with saline it was 33.3%. Twenty (71.42%) patients of Post-Operative Sore Throat developed sore throat at 2 hours after extubation, of which 15 patients belong to Saline Group (*p*-value 0.01). Twenty-one patients of Post-Operative Sore Throat had mild sore throat of which 14 patients were of Saline Group (*p*-value 0.006).

Conclusion: Ketamine nebulization postoperatively leads to reduced frequency and severity of Post-Operative Sore Throat in early post-operative period in patients in which endotracheal intubation was done for GA.

Keywords: Ketamine, Nebulization, Pharyngitis, Sore throat.

How to Cite This Article: *Akbar MZ, Farhat N, Bhatti AH, Khan KA, Jamal AR, Saleem MM. Comparison of Preoperative Ketamine Nebulization versus Saline Nebulization in Decreasing the frequency and Severity of Postoperative Sore Throat. Pak Armed Forces Med J 2024; 74(4): 1019-1023. DOI: https://doi.org/10.51253/pafmj.v74i4.9296*

INTRODUCTION

Postoperative sore throat (POST) is common condition usually experienced by patients who have undergone general anesthesia with Endotracheal tube (ETT).[1] Irritation and inflammation of trachea by ETT is responsible for POST.[2] The reported incidence in literature varies from 21-65%.[3] It is ranked as 8th most undesirable complication by patients in postoperative period.[4] POST, although a minor complication, leads to fever in early postoperative period and brings agony and dissatisfaction among patients. Various pharmacologic and non-pharmacological techniques have been developed and are being practiced nowadays with varying results with no single proven technique to reduce incidence of POST.[5] These include beclomethasone gel, nebulization and gargles of Ketamine, normal saline nebulization and Magnesium sulfate nebulization.[5,6] N-methyl-D-aspartate (NMDA) receptors which are present in peripheral nerves are responsible for nociception and inflammation.[7] Ketamine and Magnesium sulfate which are NMDA receptor antagonists are used to reduce incidence of POST in nebulization as well as gargle form.[8] Ketamine has proven more beneficial in reducing POST than magnesium sulfate due to its anti-nociceptive and anti-inflammatory properties.[2] Due to bitter taste of the Ketamine and the risk of aspiration while gargling, the use of Ketamine by aerosol route proved better by anesthetists with better acceptance by patients as well.[2] The use of Ketamine by aerosol techniques also uses much less volume of drug as compare to gargles so it has got more popularity as it is cheaper and easy to use.[9] Nebulization by normal saline has conventionally been used since long and has thought to have effects on reducing frequency of POST.[10] The

Correspondence: Dr Muhammad Zeeshan Akbar, Department of Anesthesia, Combined Military Hospital, Bahawalpur Pakistan

Received: 19 Sep 2022; revision received: 10 Mar 2023; accepted: 15 Mar 2023

importance of this topic, and a dearth of similar studies in our set-up forms the rationale of our study.

METHODOLOGY

The quasi-experimental study was carried out at the Anesthesia Department of Combined Military Hospital Bahawalpur, Pakistan, from January to June 2022. Approval from the Hospital Ethical Committee was sought before commencement of study (ERB: EC-14-2022). Sample size was estimated by keeping the incidence of POST in Ketamine and normal saline group i.e. 14.6% with Ketamine and 35.4% with saline.[10]

Inclusion Criteria: Adult patients aged 20-60 years, of either gender with ASA class 1-2, who were planned for elective surgery of less than 2 hours duration under general anesthesia (GA) with endotracheal tube (ETT) were included.

Exclusion Criteria: All patients who had history of infection of upper respiratory tract, COPD, history of sore throat in last 01-month, emergency surgeries and patients undergoing surgery of neck and head region were not included in the study.

Non-probability consecutive sampling technique was used to include the patients. Lottery method was used to allocate 60 patients each to Groups A and B (Figure). Group-A patients underwent nebulization by Ketamine 50mg 1ml with 4ml of normal saline while in Group-B nebulization was done by 5ml of normal saline solution for 15 min by same nebulizer machine. Patients were nebulized for 15 minutes before induction of general anesthesia. After nebulization induction was done by intravenous propofol 2milligram/kg and atracurium 0.5mg/kg. Intubation was then done by consultant anesthetist using same laryngoscope and cuffed ETT were used. At completion of surgery suctioning of oropharynx was done with soft oral suction catheters and patients were shifted to recovery units. Post-graduate trainees were asked to observe for POST at 0, 2, 6, 12 and 24 hours post intubation and mark on a preformed proforma. Patients were labeled as POST according to 4-point table,[11] i.e. 0 was no sore throat, 1 was mild sore throat (sore throat on asking), 2 was moderate sore throat (patient told about sore throat on his own), 3 was severe sore throat (change of voice with throat pain). If sore throat persisted for more than 24 hours then saline gargles and decongestants were given.

Data was analyzed using Statistical Package for Social Sciences (SPSS) version 21. Percentages and frequencies were calculated for categorical variables while numerical data was represented by mean and standard deviation. The *p*-value for qualitative variables was calculated by using Chi square test. The significance level was set at $p \leq 0.05$.

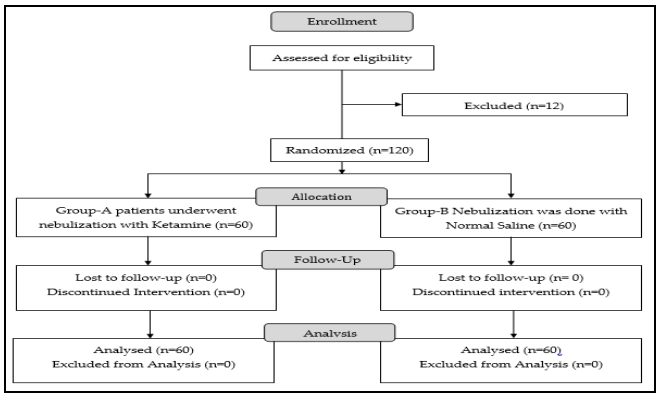

Figure: Patient Flow Diagram (n=120)

RESULTS

One hundred and twenty patients were included (60 in each group). There were 66 (55%) males and 54 (45%) females. Mean age of patients in Ketamine group (Group-A) was 45.10±10.54 years and in saline group (Group-B) mean age was 44.46±10.78 years. Mean operative time in Group-A was 1.51±0.50 hours while in Group-B mean operative time was 1.48±0.52 hours. Most patients included were of general surgery (37.5%) followed by urology (29.16%). All demographics of patients are described in Table-I.

Table-I: Demographics of Patients (n=120)

Variables		Ketamine Nebulization-Group (Group-A) (n= 60)	Saline Nebulization-Group (Group-B) (n=60)
Age (years)		45.10±10.54	44.46±10.78
Gender	Males	32(53.3%)	34 (56.7%)
	females	28 (46.7%)	26 (43.3%)
Type of surgery	General surgery	22(36.7%)	23(38.3%)
	Breast surgery	7(11.7%)	9(15%)
	Orthopedic surgery	13(21.7%)	11(18.3%)
	Urology	18(30%)	17(28.3%)
Mean operative time (hours)		1.51±0.50	1.48±0.52

Post procedure patients were observed for POST at different time periods. Total 28 patients (23.3%) developed POST at some time after extubation. The frequency of POST with Ketamine was 13.3% and with saline it was 33.3%. 20(71.42%) patients of POST developed sore throat at 2 hours after extubation of which 15 patients belong to saline group (*p*-value 0.01) and 4 more patients developed POST at 6 hours (*p*-value 0.02). The comparison of frequency of POST in both groups with their *p*-values is indicated in Table-II.

Table-II: Comparison of Incidence Frequency of Post-Operative Sore Throat (POST) in Both Groups (n=120)

Variables	Ketamine - Group (Group-A) (n=60)	Saline -Group (Group-B) (n=60)	*p*-value
2 hours	5(8.3%)	15(25%)	0.01
6 hours	7(11.7%)	17(28.3%)	0.02
12 hours	8(13.3%)	20(33.3%)	0.009
24 hours	8(13.3%)	20(33.3%)	0.009

Out of 28 patients of POST 21(17.5%) patients had mild sore throat of which 14(23.3%) patients were of saline Group-And 7(11.7%) from Ketamine group (*p*-value 0.006). The comparison of variables in both groups is indicated in Table-III.

Table-III: Comparison of Severity of Post-Operative Sore Throat (POST) in Both Groups (n=120)

Variables	Ketamine-Group (Group-A) (n=60)	Saline-Group (Group-B) (n=60)	*p*-value
Mild	7(11.7%)	14(23.3%)	0.006
Moderate	1(1.7%)	6(10%)	< 0.001

DISCUSSION

Post-Operative Sore Throat (POST) is a common problem encountered by patients after endotracheal intubation which brings disappointment in patients regarding bad recovery from anesthesia and poor quality of care.[12] Several factors like mucosal injury, endotracheal tube size, active suctioning at extubation, ETT cuff pressure, duration of surgery and difficult intubation results in post-operative sore throat.[13,14] POST can be easily prevented by using ETT of appropriate size, by using soft suctioning catheters and removing ETT when cuff is fully deflated and by lubricating ETT with gel before intubation as reported in literature.[15]

In our study the overall frequency of POST was 23.3%. The frequency of POST in Ketamine group was 13.3% and it was 33.3% with saline group. These results are similar to the results shared by Thomas *et al.* in their study who reported an overall incidence of 25% with 35.4% of saline group developed POST.[10] Similarly Charan *et al.* reported an overall incidence of 29.33% with incidence of 46% with saline nebulization and 20% with Ketamine.[1] Pathak *et al.* reported an incidence of 33% in their patients with incidence of 20% in patients of Ketamine nebulization.[9] Brindha *et al.* stated in their study that overall incidence of POST was 37.3% with 20% in patients who were nebulized with Ketamine.[8] Thomas *et al.* reported an incidence of 17% of sore throat in their study which is less as compare to other similar studies.[16]

In our study out of 28 patients of POST 21 patients (75%) had mild sore throat and 7 patients (25%) had moderate sore throat. None of the patient had developed severe sore throat. 21 patients of POST had saline nebulization preoperatively. These results are similar to results by Thomas *et al.* in their study in which mild and moderate sore throat cases were more seen in saline Group-As compare to Ketamine group.[10] A study by Aditya *et al.* stated that the incidence and severity of POST was remarkably low in patients in which nebulization with Ketamine was done preoperatively.[17] A study by Chan *et al.* suggested in their study that topical use of Ketamine is better in reducing POST than its systemic use.[18] Ketamine reduces the local inflammatory process in throat by acting on NMDA receptors (antagonistic and anti-inflammatory properties) resulting in significant decrease in the incidence and severity of POST in our study which is similar to as described in literature.[19-21] In our study there was significantly low frequency at [2, 6,12] and 24 hours after extubation which is similar to results as shared by Gupta *et al.* in their study that Ketamine significantly reduces incidence of POST in early post-operative period.[22] Similarly Patodi V *et al.* shared that nebulization by Ketamine significantly lowers POST at,[2,4,6,12] and 24 hours postoperatively.[23]

LIMITATIONS OF THE STUDY

Patients were not followed for more than 24 hours postoperatively and no adverse effects of administered drug were observed during the study which may be done in next upcoming studies which may lead to better patient outcome.

CONCLUSION

We conclude that preoperative Ketamine nebulization leads to reduced frequency and severity of POST in early post-operative period in patients in which endotracheal intubation was done for GA.

Conflict of Interest: None.

Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

MZA & NF: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

AHB & KAK: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

ARJ & MMS: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

REFERENCES

1. Charan SD, Khilji MY, Jain R, Devra V, Saxena M. Inhalation of ketamine in different doses to decrease the severity of postoperative sore throat in surgeries under general anesthesia patients. Anesth Essays Res 2018; 12(3): 625-629. https://doi.org/10.4103/aer.AER_65_18
2. Segaran S, Bacthavasalame AT, Venkatesh RR, Zachariah M, George SK, Kandasamy R, et al. Comparison of nebulized ketamine with nebulized magnesium sulfate on the incidence of postoperative sore throat. Anesth Essays Res 2018; 12(4): 885-890. https://doi.org/10.4103/aer.AER_148_18
3. Prasant NV, Mohapatro S, Jena J, Moda N. Comparison of preoperative nebulization with 4% lignocaine and ketamine in reduction of incidence of postoperative sore throat. Anesth Essays Res 2021; 15(3): 316-320. https://doi.org/10.4103/aer.aer_105_21
4. Yadav M, Gopinath R. Comparison of the effect of ketamine, tramadol, 1.5% saline and normal saline gargle on post-operative sore throat after endotracheal intubation. Indian J Anesth Analg 2018; 5: 579-585. http://dx.doi.org/10.21088/ijaa.2349.8471.5418.12
5. Jain S, Barasker SK. A comparative study of preoperative ketamine and MgSO4 nebulisation for incidence of post operative sore throat after endotracheal intubation. Int J Contemp Med Res 2017; 4(6): 1356-1359. https://doi.org/10.21275/sr23228131538
6. Mostafa EA, Abdel AS, Mahmoud MD. 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 2018; 73(8): 7244-7250. https://dx.doi.org/10.21608/ejhm.2018.18262
7. Medeiros P, Negrini-Ferrari SE, Palazzo E, Maione S, Ferreira SH, de Freitas RL, et al. N-methyl-d-aspartate receptors in the prelimbic cortex are critical for the maintenance of neuropathic pain. Neurochem. Res 2019; 44(9): 2068-2080. https://doi.org/10.1007/s11064-019-02843-z
8. Brindha R, Naveena P, Chiraag S, Senthilkumar M, Gaur A, Shankar R. Effect of magnesium sulphate nebulization on the incidence of post-operative sore throat. Int J Med Anesth 2020; 3(4): 23-26. https://doi.org/10.33545/26643766.2020.v3.i4a.161
9. Pathak B, Panchal N, Mevcha Sr, Chaudhari M. Redefining the Role of Ketamine for Topicalisation and its Comparison with the Legend Lignocaine for Oesophagogastroduodenoscopies -A Randomised Clinical Study. J Clin Diagnostic Res 2022; 16(7). https://doi.org/ 10.7860/JCDR/2022/55049.16671
10. Thomas D, Bejoy R, Zabrin N, Beevi S. Preoperative ketamine nebulization attenuates the incidence and severity of postoperative sore throat: A randomized controlled clinical trial. Saudi J Anaesth 2018; 12(3): 440-445. https//:doi.org/10.4103/sja.SJA_47_18
11. Kuriyama A, Maeda H, Sun R, Aga M. Topical application of corticosteroids to tracheal tubes to prevent postoperative sore throat in adults undergoing tracheal intubation: a systematic review and meta-analysis. Anaesthesia 2018; 73(12): 1546-1556. https://doi.org/10.1111/anae.14273
12. Gustafsson UO, Scott MJ, Hubner M, Nygren J, Demartines N, Francis N, et al. Guidelines for perioperative care in elective colorectal surgery: Enhanced Recovery After Surgery (ERAS®) Society recommendations: 2018. World J Surg 2019; 43(3): 659-695. https://doi.org/10.1007/s00268-018-4844-y
13. Hari KS, Saravanan D, Ranganathan. Post-operative sore throat-incidence and contributory factors. J Pharm Biomed Sci 2013; 26: 286–292.
14. Jaensson M, Olowsson LL, Nilsson U. Endotracheal tube size and sore throat following surgery: A randomized-controlled study. Acta Anaesthesiol Scand 2010; 54: 147–153. https://doi.org/10.1111/j.1399-6576.2009.02166.x
15. Şentürk M, El Tahan MR, Szegedi LL, Marczin N, Karzai W, Shelley B, et al. Thoracic anesthesia of patients with suspected or confirmed 2019 novel coronavirus infection: preliminary recommendations for airway management by the European Association of Cardiothoracic Anaesthesiology Thoracic Subspecialty Committee. J Cardiothorac Vasc Anesth 2020; 34(9): 2315-2327. https://doi.org/10.1053/j.jvca.2020.03.059

16. Thomas D, Chacko L, Raphael PO. Dexmedetomidine nebulisation attenuates post-operative sore throat in patients undergoing thyroidectomy: A randomised, double-blind, comparative study with nebulised ketamine. Indian J Anaesth 2020; 64(10): 863-868. https://doi.org/10.4103/ija.IJA_406_20
17. Aditya AK, Das B, Mishra DK. Assessment of nebulized ketamine for reductions of incidence and severity of post-operative sore throat. Int J Med Health Res 2017; 3: 130–132.
18. Chan L, Lee ML, Lo YL. Postoperative sore throat and ketamine gargle. Br J Anaesth 2010; 105: 97. https://doi.org/10.1093/bja/aeq151
19. Khatavkar SS, Bakhshi RG. Comparison of nasal midazolam with ketamine versus nasal midazolam as a premedication in children. Saudi J Anaesth 2014; 8: 17–21. https://doi.org/10.4103/1658-354X.125904
20. Mehrotra S, Kumar N, Khurana G, Bist SS. Post operative sore throat incidence after nebulization with ketamine, lidocaine and budesonide. Int J Med Sci Clin Inventions 2017; 4: 2994–2998. https://doi.org/10.18535/ijmsci/v4i6.05
21. Kumar R. Relative assessment of ketamine nebulisation and ketamine gargle in attenuating post-operative sore throat. J Med Sci Clin Res 2017; 30(50): 31-53. https://doi.org/10.18535/jmscr/v5i7.160
22. Gupta SK, Tharwani S, Singh DK, Yadav G. Nebulized magnesium for prevention of postoperative sore throat. Br J Anaesth 2012; 108: 168–169. https://doi.org/10.1093/bja/aer437
23. Patodi V, Jangid Nk, Kumari M, Sethi Sk, Jain N, Jain K. Effect of Preoperative Ketamine Nebulisation on Attenuation of Incidence and Severity of Postoperative Sore Throat, Hoarseness of Voice and Cough: A Randomised Double-Blind Study. J Clin of Diagn Res 2022; 16(1): UC09-UC13. https://doi.org/10.7860/JCDR/2022/49872.15824