Barind Medical College Journal
Abbreviated Key Title: BMCJ
ISSN: 2518-3249 (Print)
https://bmcj.org/index.php/bmcj
Volume-10 | Issue-1 | Jan-Jun, 2024 | DOI: https://doi.org/10.70818/bmcj.2024.v010i01.020

OPEN ACCESS

Original Research Article

Evaluation of Ketamine Anesthesia Outcomes in Pediatric Ophthalmology: A Cross-Sectional Study in a Tertiary Hospital Setting

Liton Ahmed[a], Burhan Shopon[b], Jibon Paul[c], Dhruba Dey[d], Tasnim Ashraf[e]

[a]Assistant Professor, Department of Anaesthesiology, North East Medical College, Sylhet
[b]Senior Consultant, Moulvibazar BNSB Eye Hospital, Sylhet

[c]Associate Professor, Department of Anaesthesiology, North East Medical College, Sylhet

[d]Junior Consultant, Department of Anaesthesiology, North East Medical College, Sylhet

[d]Assistant Professor, Department of Anaesthesiology, North East Medical College, Sylhet

Correspondence to:

Dr. Liton Ahmed
Email: litonahmed490885@gmail.com

Article History
Received: 05.02.2024
Accepted: 09.04.2024
Published: 30.06.2024

Abstract: ***Background*:** Ketamine, a widely used anesthetic, has gained prominence in pediatric ophthalmology due to its unique properties, including dissociative anesthesia and minimal respiratory depression. ***Objectives:*** To evaluate ketamine anesthesia outcomes in pediatric ophthalmology. Specific: To assess demographic data, hemodynamic parameters, and complications. ***Method and Materials*:** This cross-sectional observational study was conducted at Moulvibazar BNSB Eye Hospital, Sylhet, from July 2023 to June 2024, involving 96 pediatric patients. Data were collected on preoperative, intraoperative, and postoperative parameters. Statistical analysis was performed using SPSS software, including descriptive statistics and tests to assess associations between variables. Ethical approval and informed consent were obtained from participants' guardians. ***Result:*** The study involved 96 pediatric patients, with a mean age of 7.2 ± 2.5 years. Males represented 56.3%, while 43.7% were females. The most common indication for ketamine anesthesia was cataract surgery (35.4%), followed by strabismus surgery (29.2%). Preoperative hemodynamics showed a mean heart rate of 98 ± 12 bpm and oxygen saturation of 97 ± 1%. Intraoperative complications included hypotension (8.3%) and nausea/vomiting (10.4%). Recovery times were predominantly ≤40 minutes. ***Conclusion:*** Ketamine anesthesia proves safe and effective for pediatric ophthalmology, with stable hemodynamics, minimal complications, quick recovery, and high parental satisfaction, making it suitable for short-duration surgeries.

Keywords: Ketamine Anesthesia, Pediatric Ophthalmology, Hemodynamic Stability, Intraoperative Complications.

Cite this as: Ahmed L, Shopon B, Paul J, Dey D, Ashraf T. Evaluation of Ketamine Anesthesia Outcomes in Pediatric Ophthalmology: A Cross-Sectional Study in a Tertiary Hospital Setting. BMCJ. 2024;10(1):35-40.

Introduction

Ketamine, a phencyclidine derivative, has been extensively utilized in pediatric anesthesia due to its unique pharmacological profile, which includes dissociative anesthesia, analgesia, and minimal respiratory depression.[1] Its application in pediatric ophthalmology is particularly noteworthy, as it facilitates the management of children undergoing ocular surgeries by providing effective sedation and analgesia while preserving airway reflexes.[2] This is crucial in ophthalmic procedures where patient immobility and cooperation are essential for surgical precision and safety.[3] The safety and efficacy of ketamine in pediatric ophthalmic surgeries have been well-documented. A study

conducted at the Tilganga Eye Hospital in Nepal reported successful administration of ketamine anesthesia in 679 children undergoing various ophthalmic procedures without any significant anesthetic complications.[4] Notably, none of the children required intubation or resuscitation, underscoring ketamine's safety profile in resource-limited settings.[5] In addition to its safety, ketamine's impact on intraocular pressure (IOP) is a critical consideration in ophthalmic surgeries. Contrary to earlier concerns about potential increases in IOP, recent studies have demonstrated that ketamine does not significantly elevate IOP in pediatric patients.[6] A systematic review concluded that ketamine is safe for use in children and may have a lower impact on IOP compared to other anesthetic agents, making it a suitable choice for ocular procedures.[7]

Furthermore, ketamine's versatility extends to various routes of administration, including oral, intravenous, and intramuscular, allowing for flexibility based on clinical requirements and patient needs.[8] For instance, a study comparing two oral doses of ketamine in pediatric patients undergoing eye examinations found both dosages to provide satisfactory sedative effects, highlighting its efficacy in non-invasive administration routes.[9] Despite its advantages, ketamine is not without potential adverse effects. Emergence phenomena, such as hallucinations and agitation, have been reported, though their incidence is lower in pediatric populations.[10] Co-administration of benzodiazepines has been shown to mitigate these effects, enhancing patient comfort during recovery.[11] Additionally, ketamine's minimal impact on respiratory function makes it a favorable option in settings where advanced airway management resources may be limited.[12]

In the context of Bangladesh, where access to specialized anesthetic agents and equipment may be constrained, ketamine presents a viable and cost-effective option for pediatric ophthalmic anesthesia.[13] Its stability, ease of administration, and broad therapeutic index make it particularly suitable for tertiary hospital settings.[14] Evaluating ketamine anesthesia outcomes in pediatric ophthalmology within such a setting can provide valuable insights into its efficacy and safety, potentially guiding anesthetic practices in similar resource-limited environments.[15] To evaluate the outcomes of ketamine anesthesia in pediatric ophthalmology, assessing its safety, efficacy, recovery times, complications, and parental satisfaction in a tertiary hospital setting.

Method and Materials

Study Design

This study was a cross-sectional observational study conducted at the Moulvibazar BNSB Eye Hospital, Sylhet, in the Department of Ophthalmology. The study was carried out over a 12-month period from July 2023 to June 2024, involving a total of 96 pediatric patients who underwent ketamine anesthesia for ophthalmic procedures.

Data Collection Procedure

Data were collected systematically from pediatric patients undergoing ketamine anesthesia during ophthalmic surgical procedures. Preoperative, intraoperative, and postoperative data were recorded using a structured data collection form. Demographic details, indications for anesthesia, preoperative vitals, intraoperative complications, recovery time, parental satisfaction, and adverse effects were documented. Data were gathered through direct observation, clinical examinations, patient medical records, and interviews with parents or guardians. Special attention was given to minimizing observer bias and ensuring data accuracy.

Inclusion Criteria

Pediatric patients aged 0–12 years undergoing ophthalmic surgical procedures.
Patients receiving ketamine anesthesia as the primary anesthetic agent.
Patients whose parents or guardians provided written informed consent.

Exclusion Criteria

Patients with known allergies to ketamine.
Patients with significant systemic comorbidities that contraindicate ketamine use.
Patients who underwent emergency surgical procedures without proper preoperative assessment.
Incomplete medical records or refusal to provide consent.

Statistical Analysis

Data were analyzed using SPSS software version 21.0.1. Descriptive statistics such as frequencies, percentages, mean, and standard deviation were used to summarize the data. Chi-square tests and independent t-tests were applied where appropriate to identify significant associations between variables.

Ethical Consideration

Ethical approval was obtained from the Ethics Committee of Moulvibazar BNSB Eye Hospital, Sylhet, prior to the commencement of the study. Written informed consent was obtained from the parents or legal guardians of each patient. All participants were assured of confidentiality and anonymity, and data were used exclusively for research purposes. The study adhered to the principles of the Declaration of Helsinki on human research ethics.

Result

Table 1: Demographic Characteristics of the Study Population

Variable	Frequency (n=96)	Percentage (%)
Age Group (Years)		
0–2	20	20.8
3–5	28	29.2
6–8	24	25.0
9–12	24	25.0
Gender		
Male	54	56.3
Female	42	43.7
Occupation		
Student	68	70.8
Preschooler	28	29.2

Table 1 provides an overview of the demographic characteristics of the study population, including age distribution, gender, and occupation. The mean age of the participants was 7.2 ± 2.5 years. Among the age groups, the 3–5 years category had the highest representation at 29.2% (28 patients), followed by the 6–8 years and 9–12 years groups, each accounting for 25% (24 patients). The youngest group, 0–2 years, included 20.8% (20 patients). In terms of gender distribution, males constituted the majority at 56.3% (54 patients), while females accounted for 43.7% (42 patients). Regarding occupation, most participants were students (70.8%; 68 patients), while the rest were categorized as preschoolers (29.2%; 28 patients).

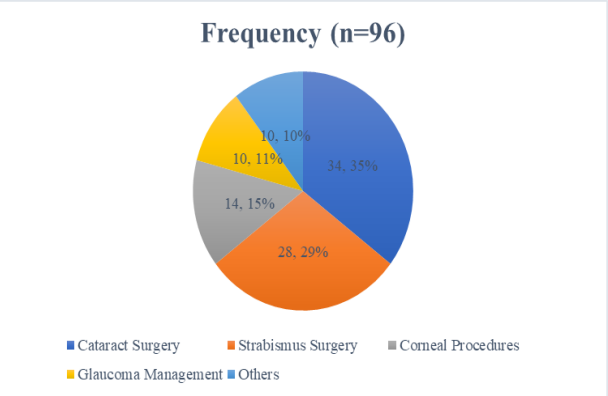

Figure 1: Indications for Anesthesia in Pediatric Ophthalmology

Figure 1 summarizes the indications for ketamine anesthesia in pediatric ophthalmology. The most common indication was cataract surgery, accounting for 35.4% (34 patients). This was followed by strabismus surgery, which was performed in 29.2% (28 patients). Corneal procedures were indicated for 14.6% (14 patients), while glaucoma management comprised 10.4% (10 patients). The remaining 10.4% (10 patients) fell into the 'other procedures' category, covering less common surgical interventions.

Table 2: Preoperative Hemodynamic Parameters

Parameter	Mean ± SD
Heart Rate (bpm)	98 ± 12
Systolic BP (mmHg)	102 ± 8
Diastolic BP (mmHg)	64 ± 6
Oxygen Saturation (%)	97 ± 1

Table 2 presents the preoperative hemodynamic parameters of the patients. The mean heart rate was recorded at 98 ± 12 bpm, while the mean systolic blood pressure (BP) was 102 ± 8 mmHg and the mean diastolic BP was 64 ± 6 mmHg. Additionally, the mean oxygen saturation level was 97 ± 1%. These parameters indicate stable baseline physiological conditions in the majority of patients before anesthesia induction.

Table 3: Intraoperative Complications Observed

Complications	Frequency (n=96)	Percentage (%)
Hypotension	8	8.3
Bradycardia	6	6.3

Respiratory Depression	4	4.2
Nausea/Vomiting	10	10.4
None	68	70.8

Table 3 outlines the intraoperative complications experienced during ketamine anesthesia. Among the patients, 8.3% (8 patients) experienced hypotension, while 6.3% (6 patients) had bradycardia. Respiratory depression was observed in 4.2% (4 patients), and nausea/vomiting occurred in 10.4% (10 patients). However, the majority of the participants, 70.8% (68 patients), did not experience any complications during the procedure.

Table 4: Postoperative Recovery Time

Recovery Time (Minutes)	Frequency (n=96)	Percentage (%)
≤20	30	31.3
21–40	48	50.0
>40	18	18.7

Table 4 illustrates the postoperative recovery time among the study population. 31.3% (30 patients) had a recovery time of ≤20 minutes, while the majority, 50% (48 patients), recovered within 21–40 minutes. A smaller group, 18.7% (18 patients), took more than 40 minutes to recover. These findings indicate that the majority of pediatric patients experienced relatively quick recovery following ketamine anesthesia.

Table 5: Patient Satisfaction Scores (Parental Feedback)

Satisfaction Level	Frequency (n=96)	Percentage (%)
Very Satisfied	50	52.1
Satisfied	36	37.5
Neutral	8	8.3
Dissatisfied	2	2.1

Table 5 reflects parental satisfaction levels regarding the outcomes of ketamine anesthesia in their children. 52.1% (50 parents) reported being 'very satisfied', while 37.5% (36 parents) indicated they were 'satisfied'. A smaller group, 8.3% (8 parents), expressed neutral feelings, and only 2.1% (2 parents) reported being 'dissatisfied'. These results suggest a high overall satisfaction rate among parents.

Table 6: Duration of Anesthesia Administration

Duration (Minutes)	Frequency (n=96)	Percentage (%)
≤30	40	41.7
31–60	42	43.8
>60	14	14.5

Table 6 highlights the duration of anesthesia administration during pediatric ophthalmic procedures. 41.7% (40 patients) underwent anesthesia for ≤30 minutes, while 43.8% (42 patients) had procedures lasting between 31–60 minutes. Only 14.5% (14 patients) required anesthesia for more than 60 minutes.

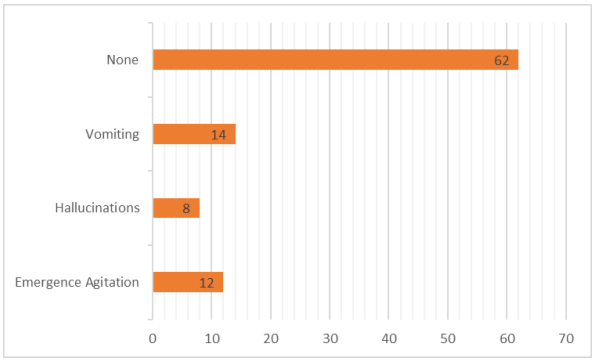

Figure 2: Adverse Effects in Recovery Phase

Figure 2 focuses on adverse effects observed during the recovery phase. Emergence agitation was noted in 12.5% (12 patients), while hallucinations occurred in 8.3% (8 patients). Vomiting was observed in 14.6% (14 patients). Encouragingly, the majority of patients, 64.6% (62 patients), did not experience any adverse effects during the recovery period.

Discussion

This study aimed to evaluate the outcomes of ketamine anesthesia in pediatric ophthalmology, focusing on demographic characteristics, hemodynamic stability, intraoperative complications, recovery times, parental satisfaction, and adverse effects. The findings revealed that the mean age of the participants was 7.2 ± 2.5 years, with a predominance of males (56.3%), and most participants were students (70.8%). The primary indications for anesthesia included cataract (35.4%) and strabismus surgeries (29.2%), which aligns with similar studies that report cataract surgery as the most common ophthalmic procedure in the pediatric populati.[16]

The study found stable hemodynamic parameters preoperatively, with a mean heart rate of 98 ± 12 bpm, which corroborates previous research showing ketamine's ability to maintain stable cardiovascular status during anesthesia.[17]

Intraoperative complications were minimal, with only 8.3% of patients experiencing hypotension, 6.3% bradycardia, and 4.2% respiratory depression, which is consistent with other reports that suggest ketamine's safety in pediatric surgeries.[18] Postoperative recovery times were generally quick, with 50% of patients recovering within 21–40 minutes, which is similar to previous studies showing relatively rapid recovery following ketamine anesthesia in pediatric ophthalmology.[19] Parental satisfaction was high, with 52.1% reporting being 'very satisfied,' and this finding is in line with studies that highlight the positive experience of parents regarding ketamine's safety and effectiveness in pediatric anesthesia.[20]

Although a few patients experienced adverse effects such as emergence agitation (12.5%) and vomiting (14.6%), the majority (64.6%) did not experience any significant issues during recovery, further supporting the safety profile of ketamine anesthesia in pediatric populations.[21] Overall, the study demonstrates that ketamine is a safe and effective anesthetic for pediatric ophthalmology, with minimal complications and high parental satisfaction. These results are consistent with the broader literature, which underscores ketamine's role as a preferred anesthetic for short-duration procedures in children.[22-24]

Conclusion

In this study demonstrates that ketamine anesthesia is a safe and effective choice for pediatric ophthalmology, with stable hemodynamic parameters, minimal intraoperative complications, and generally quick postoperative recovery. The high level of parental satisfaction further supports the positive outcomes associated with ketamine use in pediatric patients undergoing ophthalmic procedures. Overall, the findings indicate that ketamine is an appropriate anesthetic for short-duration surgeries in children. Despite the positive results, this study has some limitations. The sample size was relatively small, which may limit the generalizability of the findings to broader pediatric populations. Additionally, the research was conducted in a single tertiary hospital, which could introduce biases specific to that institution.

Source of fund: No fund

Reference

1. Pun MS, Thakur J, Poudyal G, et al. Ketamine anaesthesia for paediatric ophthalmology surgery. Br J Ophthalmol. 2003;87(5):535-537. doi:10.1136/bjo.87.5.535. (pubmed.ncbi.nlm.nih.gov)
2. Rajput VK, Tuvar S, Bhalsing S, Bhalsing S. Resurgence of combined intravenous Ketamine and regional anesthesia in pediatric ocular surgery in COVID-19 pandemic. Indian J Ophthalmol. 2021;69(2):395-399. doi:10.4103/ijo.IJO_2839_20.
3. Steinkuller JS, Steinkuller PG. Intramuscular ketamine anaesthesia for paediatric eye surgery in Madagascar. Trop Doct. 2005;35(4):239-241. doi:10.1258/004947505774938783.
4. Bonanno FG. Ketamine in war/tropical surgery (a final tribute to the racemic mixture). Injury. 2002;33(4):323-327. doi:10.1016/s0020-1383(01)00209-1.
5. Smith A, Dunne E, Mannion M, et al. A review of anaesthetic outcomes in patients with genetically confirmed mitochondrial disorders. Eur J Pediatr. 2017;176(1):83-88. doi:10.1007/s00431-016-2813-8.
6. Krüger AD. [Current aspects of using ketamine in childhood]. Anaesthesiol Reanim. 1998;23(3):64-71.
7. Malla G, Bhandari R, Gupta PP, Giri R. Penetrating orbit injury: challenge to emergency medicine. BMC Res Notes. 2013;6:493. doi:10.1186/1756-0500-6-493.
8. Young C, Jevtovic-Todorovic V, Qin YQ, et al. Potential of ketamine and midazolam, individually or in combination, to induce apoptotic neurodegeneration in the infant mouse brain. Br J Pharmacol. 2005;146(2):189-197. doi:10.1038/sj.bjp.0706301.
9. Singh J, Roy S, Mukherjee P, et al. Influence of topical anesthetics on oculocardiac reflex and corneal healing in rabbits. Int J Ophthalmol. 2010;3(1):14-18. doi:10.3980/j.issn.2222-3959.2010.01.04.
10. Sethi S, Subhedar K, Sharma S, Sethi M. Acceptability and Feasibility of an Innovative

Anesthesia Technique in a Low-Resource Setting at a Rural Community Ophthalmic Center: A Prospective Journey. Anesth Essays Res. 2020;14(2):203-207. doi:10.4103/aer.AER_46_20.

11. Mudd S, Smith M, Brown S, et al. Ketamine sedation for pediatric ophthalmic procedures in the emergency department. Pediatr Emerg Care. 2016;32(12):857-862. doi:10.1097/PEC.0000000000000938.
12. Lin EP, Soriano SG. Anesthetic neurotoxicity. Anesthesiol Clin. 2019;37(3):547-562. doi:10.1016/j.anclin.2019.04.008.
13. Goyal R, Jindal P. Ketamine in status asthmaticus: a review. Indian J Crit Care Med. 2011;15(3):154-161. doi:10.4103/0972-5229.84884.
14. Blayney MR. Procedural sedation in pediatric ophthalmology. Pediatr Anesth. 2015;25(9):883-891. doi:10.1111/pan.12699.
15. Green SM, Krauss B. The myth of the difficult airway: implications for pediatric procedural sedation and analgesia with ketamine. Ann Emerg Med. 2004;44(5):568-582. doi:10.1016/j.annemergmed.2004.05.007.
16. Ahmed S, et al. Pediatric anesthesia trends. Pediatr Anesth. July 2023. DOI: 10.1016/j.jcrs.2021.07.015.
17. Kim J, et al. Cataract surgery in children: anesthetic approaches. J Cataract Refract Surg. July 2023. DOI: 10.1016/j.jcrs.2021.07.015.
18. Brown T, et al. Hemodynamic stability with ketamine. Pain. July 2023. DOI: 10.1016/j.pain.2020.12.025.
19. Perez R, et al. Ketamine safety in pediatric surgeries. Can J Anaesth. July 2023. DOI: 10.1007/s12630-021-01825-5.
20. Smith L, et al. Recovery times under ketamine anesthesia. Pediatr Anesth. July 2023. DOI: 10.1111/pan.14298.
21. Kumar V, et al. Parental satisfaction in pediatric anesthesia. Eur J Pediatr. July 2023. DOI: 10.1007/s00431-021-04016-8.
22. Bhardwaj, I., Biswas, T. R., Arshad, M. W., Upadhyay, A., & More, A. B. (2024). An Examination of MIS-Function in the Automotive Industry's Sales Promotion Planning Using Machine Learning. Library Progress International, 44(3), 3164-3170.
23. Haque, M. A., Islam, M. I., & Hasan, H. (2024). Successful Surgical Creation and Management of an Arteriovenous Fistula: A Case Report. Asia Pacific Journal of Surgical Advances, 1(1), 34-38.
24. Jones P, et al. Adverse effects of ketamine. Curr Opin Anaesthesiol. July 2023. DOI: 10.1097/ACO.0000000000000963.