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Original Research Article

Comparison of The Efficacy of Audiovisual Tools and Intranasal Midazolam in Reducing Preoperative Anxiety in Pediatric Patients

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Abstract: *Preoperative anxiety is a common psychological challenge in pediatric surgical patients that can affect induction, recovery, and overall surgical experience. Both pharmacological and non-pharmacological interventions have been used to manage anxiety, with intranasal midazolam (INM) and audiovisual tools being among the most promising. This study aimed to compare the efficacy of audiovisual tools versus intranasal midazolam in reducing preoperative anxiety in children undergoing elective surgery under general anesthesia.* ***Methods:*** *This randomized controlled trial was conducted at the National Hospital and Medical Centre, Lahore, from May to November 2024. Sixty pediatric patients aged 5–13 years, ASA class I or II, were randomly assigned to two equal groups. Group A received audiovisual distraction (cartoons, movies, or video games), while Group B received intranasal midazolam (0.2 mg/kg, maximum 10 mg). Anxiety levels were measured using the Modified Yale Preoperative Anxiety Scale (mYPAS) at three time points: upon arrival (T1), 60 minutes before intervention (T2), and 15 minutes before induction (T3). Efficacy was defined as achieving an mYPAS score ≤30 before induction. Data were analyzed using SPSS v26.0, with $p < 0.05$ considered significant.* ***Results:*** *Both interventions effectively reduced preoperative anxiety, but the reduction was significantly greater in the audiovisual group. Mean mYPAS scores decreased from 45.93 ± 2.66 at T1 to 26.37 ± 3.66 at T3 in Group A, and from 44.83 ± 3.70 to 29.13 ± 4.83 in Group B. Effective anxiolysis (mYPAS ≤30) was achieved in 90% of patients in Group A versus 63.3% in Group B ($p = 0.015$). Audiovisual tools were particularly effective among younger (5–9 years) and female participants. No significant adverse events were reported in either group.* ***Conclusion:*** *Audiovisual tools demonstrated superior efficacy compared with intranasal midazolam in alleviating preoperative anxiety among pediatric patients. As a safe, non-invasive, and engaging alternative, audiovisual distraction should be considered a preferred approach for preoperative anxiety management, especially in resource-limited and pediatric-centered surgical settings.*

Keywords: Pediatric anxiety, intranasal midazolam, audiovisual tools, Preoperative preparation, Modified Yale Preoperative Anxiety Scale (mYPAS)

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Introduction

The effectiveness of preoperative anxiety management in pediatric patients is a significant concern in contemporary anesthesia practice. Preoperative anxiety can affect a child's psychological wellbeing and complicate surgical processes, potentially leading to longer induction times and increased postoperative complications (1). Implementing effective interventions is essential to minimize anxiety, particularly in children, who often experience considerable psychological distress before surgeries. Traditional approaches include pharmacological agents and non-pharmacological tools like audiovisual distraction methods. Among these, intranasal midazolam (INM) has gained traction due to its ease of administration and rapid onset of action (2).

INM has become a preferred option for premedication in the pediatric population because of its non-invasive method and the ability to achieve quick sedation [3]. Studies indicate that INM may be more effective than other forms of sedation, such as oral midazolam or ketamine, in enhancing compliance and reducing anxiety during preoperative preparations (4, 5). The rapid absorption of midazolam when administered intranasally facilitates effective anxiolysis prior to surgical induction (2). Furthermore, intranasal midazolam has a favorable safety profile associated with a decreased incidence of severe side effects, making it appropriate for outpatient procedures. However, variability in efficacy among individuals necessitates further comparative studies against other sedation modalities to determine best practices (6).

Audiovisual tools, especially technologies like virtual reality (VR), present innovative non-pharmacological strategies for alleviating preoperative anxiety in children. Evidence suggests that VR provides immersive experiences that distract children from the surgical environment, lowering anxiety levels during preoperative procedures (7, 8). Incorporating technological interventions such as VR alongside pharmacological techniques may yield a synergistic effect, enhancing overall outcomes for pediatric patients facing surgery (9).

Comparative assessments between INM and audiovisual methods are limited; nonetheless, existing literature suggests that both approaches can effectively reduce anxiety (8, 10). The choice of intervention may be influenced by various clinical factors, including patient preferences, the complexity of the procedure, and specific characteristics of the child's anxiety profile (1).

The rationale for this study, particularly in the Pakistani population, is rooted in the growing recognition of cultural dynamics affecting pediatric healthcare. Many Pakistani families exhibit significant apprehension towards medical interventions, often leading to increased anxiety among children in preoperative settings. Given the traditional reliance on family involvement in healthcare, integrative approaches combining INM with visual or audiovisual distractions may enhance the effectiveness of preoperative anxiety reduction strategies, ensuring both compliance and emotional comfort for pediatric patients undergoing surgery. Exploring these modalities locally is crucial as we strive to optimize anesthesia practices and patient experiences in Pakistan.

Methodology

This randomized controlled trial was conducted at the National Hospital and Medical Centre, Lahore, Pakistan, over six months following approval from the College of Physicians and Surgeons Pakistan (CPSP)

on May 2, 2024. Ethical clearance was obtained before commencement, and the study adhered to the principles of the Declaration of Helsinki and Good Clinical Practice guidelines. The objective was to compare the efficacy of audiovisual tools and intranasal midazolam in reducing preoperative anxiety among pediatric patients undergoing elective surgery under general anesthesia.

The study population consisted of children aged 5 to 13 years of both genders who were scheduled for elective surgical procedures and classified as American Society of Anesthesiologists (ASA) physical status I or II. Only those capable of understanding and cooperating with audiovisual interventions and anxiety assessments were included. Written informed consent was obtained from all eligible participants' parents or legal guardians. Exclusion criteria included children with developmental delay, cognitive or communication impairments, history of chronic illness, previous surgery, severe anxiety disorders, or visual or auditory deficits that could interfere with audiovisual interaction. Patients undergoing emergency surgery or having known allergies or contraindications to midazolam were also excluded.

Sample size was calculated using the World Health Organization (WHO) sample size calculator, with a confidence level of 95% and power of 80%. The estimated efficacy for audiovisual distraction was 43%, and for intranasal midazolam it was 88%. Based on these assumptions, 60 participants were required, with 30 patients allocated to each group. Randomization was performed through a simple lottery method to ensure equal allocation. Group A received audiovisual tools as a non-pharmacological intervention, while Group B received intranasal midazolam as pharmacological premedication. Allocation concealment was maintained by using sequentially numbered opaque envelopes, which were opened just before an independent coordinator's intervention.

Participants in Group A were provided with age-appropriate audiovisual content such as cartoons, movies, or interactive video games designed to capture their attention and divert focus from the upcoming surgery. The audiovisual distraction was administered for at least 30 minutes before induction of anesthesia in a quiet preoperative room. Children in Group B received intranasal midazolam at a dose of 0.2 mg/kg, not exceeding a maximum of 10 mg. The drug was administered by an experienced anesthesiologist 30 minutes before anesthesia induction. Throughout the preoperative period, patients were continuously monitored for vital signs and possible adverse effects such as nasal irritation or excessive sedation. Parents were instructed not to attempt additional comforting or distraction measures during the study to avoid bias.

Preoperative anxiety levels were evaluated using the Modified Yale Preoperative Anxiety Scale (mYPAS), a validated observational tool comprising 22 items distributed across five domains: activity, emotional expressivity, vocalization, apparent arousal, and use of parents. Each domain was scored on a four-point scale, and total scores were converted to a composite value ranging from 1 to 100, with higher scores indicating greater anxiety. A score of 30 or below was considered to represent minimal or no anxiety. Anxiety assessments were conducted at three specific time points to measure changes over the preoperative period: upon arrival at the hospital (T1), sixty minutes before administration of the assigned intervention (T2), and within fifteen minutes before induction of anesthesia (T3). The difference in mean mYPAS scores from T1 to T3 was used to evaluate the efficacy of each intervention.

Efficacy was defined as the proportion of patients achieving an mYPAS score ≤30 before induction. Data on demographic characteristics, surgical type, and clinical variables were recorded using a standardized form. All participants received identical anesthetic induction and maintenance protocols to eliminate procedural variability. The same surgical and anesthesia team supervised all cases to ensure methodological consistency.

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 26.0. Continuous variables such as age, weight, and mYPAS scores were expressed as mean ± standard deviation. In contrast, categorical variables such as gender, type of surgery, and efficacy were summarized as frequencies and percentages. Between-group comparisons for continuous variables were made using independent sample t-tests, while chi-square or Fisher's exact tests were applied to categorical data. Subgroup analyses were conducted based on age, gender, weight, and surgical type, followed by post-stratification chi-square tests to evaluate interaction effects. A p-value of less than 0.05 was considered statistically significant.

Results

Sixty pediatric patients aged between 5 and 13 years were included (30 in each group). The mean age in the Audiovisual Tools group (Group A) was 10.00 ± 2.74 years, whereas in the Intranasal Midazolam group (Group B) it was 7.63 ± 1.61 years. Gender distribution was comparable between groups, with a slight male predominance in Group B. Mean body weight was higher in Group A (35.05 ± 10.23 kg) than in Group B (25.82 ± 5.73 kg). The most frequent surgeries were herniorrhaphy and tonsillectomy, followed by eye and orthopedic procedures. (Table 1).

Preoperative anxiety, assessed by the Modified Yale Preoperative Anxiety Scale (mYPAS), showed a progressive decline across all time points in both groups, with a greater reduction observed in the Audiovisual Tools group. (Table 2).

A marked decline from T1 → T3 indicates the substantial anxiolytic impact of audiovisual distraction compared with pharmacological premedication.

Efficacy, defined as achieving an mYPAS score < 30 prior to induction, was significantly higher in the Audiovisual Tools group (90 %) than in the Intranasal Midazolam group (63.3 %, $p = 0.015$). (Table 3).

Further analysis explored efficacy variations by age, gender, body weight, and surgical type.

Audiovisual Tools consistently demonstrated higher effectiveness across all strata, reaching statistical significance in younger children and females. (Table 4).

Audiovisual Tools demonstrated superior anxiolytic efficacy compared with Intranasal Midazolam ($p = 0.015$). Mean mYPAS scores dropped markedly in the Audiovisual group (45.93 → 26.37), exceeding the decline seen with midazolam (44.83 → 29.13). Female and younger (5–9 years) participants showed the most pronounced benefit. Neither weight nor surgical type significantly altered treatment response.

Table 1. Baseline demographic and surgical characteristics of study participants

Variable	Group A (Audiovisual Tools) n = 30	Group B (Intranasal Midazolam) n = 30
Age (years) Mean ± SD (Range)	10.00 ± 2.74 (5–13)	7.63 ± 1.61 (5–11)
Gender n (%) Male / Female	15 (50.0) / 15 (50.0)	19 (63.3) / 11 (36.7)
Weight (kg) Mean ± SD (Range)	35.05 ± 10.23 (16.8–48.0)	25.82 ± 5.73 (17.2–37.5)
Type of Surgery		
Tonsillectomy n (%)	12 (40.0)	5 (16.7)
Herniorrhaphy n (%)	9 (30.0)	10 (33.3)
Eye Surgery n (%)	5 (16.7)	5 (16.7)
Orthopedic Surgery n (%)	4 (13.3)	10 (33.3)

Table 2. Mean mYPAS scores at different time points

Time Point	Group A Mean ± SD	Group B Mean ± SD
T1: Upon arrival at the hospital	45.93 ± 2.66	44.83 ± 3.70
T2: 60 min before intervention	40.03 ± 2.68	38.63 ± 3.88
T3: 15 min before induction	26.37 ± 3.66	29.13 ± 4.83

Table 3. Comparison of overall efficacy between groups

mYPAS < 30 (Effective Anxiolysis)	Group A n (%)	Group B n (%)	*p*-value
Yes (< 30)	27 (90.0)	19 (63.3)	0.015
No (> 30)	3 (10.0)	11 (36.7)	

Table 4. Efficacy of treatment by stratification variables

Variable	Subgroup	Group A n (%) Effective	Group B n (%) Effective	*p*-value
Age (yrs)	5–9	11 (100)	17 (68)	0.033
	10–13	16 (84.2)	2 (40)	0.042
Gender	Male	13 (86.7)	13 (68.4)	0.213
	Female	14 (93.3)	6 (54.5)	0.020
Weight (kg)	15–30	9 (100)	16 (69.6)	0.061
	31–40	7 (77.8)	3 (42.9)	0.152
	> 40	11 (91.7)	0 (0)	–
Type of Surgery	Tonsillectomy	10 (83.3)	3 (60)	0.301
	Herniorrhaphy	9 (100)	9 (90)	0.330
	Eye Surgery	4 (80)	2 (40)	0.197
	Orthopedic Surgery	4 (100)	5 (50)	0.078

Discussion

The study presented a comparative analysis between the use of audiovisual tools (Group A) and intranasal midazolam (Group B) in managing preoperative anxiety among pediatric patients. This discussion interprets the findings in conjunction with existing literature to highlight the effectiveness of both anxiety-reducing interventions.

The demographic assessment indicated that the average age in Group A was significantly higher than that of Group B. This finding aligns with Kaur et al., which discusses the impact of patient age on the outcomes of preoperative anxiety interventions (11). The slight male predominance noted in Group B is also consistent with studies indicating gender influence on anxiety levels. However, other studies indicate that this demographic factor did not yield significant differences in effectiveness (12).

Regarding body weight, the higher mean in Group A corroborates findings suggesting heavier pediatric patients may experience different psychological responses to interventions (13). The distribution of surgical types between groups shows a variety of procedures commonly associated with preoperative anxiety, similar to patterns noted in other studies where tonsillectomies and herniorrhaphies were frequently reported (14).

The Modified Yale Preoperative Anxiety Scale (mYPAS) scores indicated a progressive reduction of anxiety over time, with audiovisual tools showing significantly greater effectiveness than intranasal midazolam during the preoperative period. The improvement in mYPAS scores from T1 to T3 in Group A (from 45.93 to 26.37) reflects a prominent anxiolytic effect. This finding is consistent with Wang et al., who highlighted that audiovisual distractions effectively reduce anxiety levels in pediatric settings (11). Moreover, the efficacy of achieving an mYPAS score of less than 30 (90% in Group A versus 63.3% in Group B) emphasizes a critical difference in managing preoperative anxiety, especially contrasted with previous studies involving midazolam, where rates of satisfactory sedation were only moderately higher (15).

Further analysis of efficacy stratified by age and gender illuminated significant reductions in preoperative anxiety, demonstrating that younger children (aged 5-9 years) and females benefited more from audiovisual tools. These findings resonate with published work indicating that younger demographics are often more susceptible to anxiety and may respond better to distraction techniques (16). Moreover, the noted efficacy in female participants corresponds with research indicating that females report higher levels of preoperative anxiety, necessitating tailored interventions (17).

The correlation between body weight and treatment efficacy did not reach statistical significance, which aligns with Gupta et al., who concluded that weight did not consistently correlate with sedation outcomes in pediatric patients (13). The impact of the type of surgery was reported to be minimal in determining efficacy, reflecting patterns seen in other studies where the type of surgery influenced only baseline anxiety levels rather than the overall efficacy of the intervention (18).

The overall conclusion from the analysis is that audiovisual tools significantly outperform intranasal midazolam in terms of anxiolytic efficacy, as evidenced by both the reduction in mYPAS scores and the proportion of patients achieving effective anxious status before induction. These results align with contemporary reviews advocating for non-pharmacological methods due to their favorable side-effect profile, particularly when compared to traditional pharmacological methods, including midazolam, which is associated with potential adverse effects like respiratory depression (19).

The implications of this study underscore the necessity for advancing pediatric anxiety management protocols in surgical settings. Particularly, this study advocates the incorporation of multimedia distractions alongside or instead of pharmacological interventions. This approach could enhance pediatric patients' surgical experience, improving compliance and outcomes.

Conclusion

Audiovisual distraction proved to be a more effective and safer alternative to intranasal midazolam in reducing preoperative anxiety among children. Its non-pharmacological nature, ease of use, and absence of adverse effects make it an efficient intervention in pediatric anesthesia practice. Integrating audiovisual methods into preoperative care protocols can enhance patient cooperation, improve surgical experiences, and minimize reliance on sedative medications in children undergoing elective surgeries.

Declarations

Data Availability statement

All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department concerned. (IRBEC-24)

Consent for publication

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Conflict of interest

The authors declared the absence of a conflict of interest.

Author Contribution

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Review of Literature, Data entry, Data analysis, and drafting an article. Conception of Study, Development of Research Methodology Design,

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Study Design, manuscript review, and critical input.

All authors reviewed the results and approved the final version of the manuscript. They are also accountable for the integrity of the study.

References

1. Lethin M., Paluska M., Petersen T., Falcon R., & Soneru C. Midazolam for anesthetic premedication in children: considerations and alternatives. Cureus 2023. https://doi.org/10.7759/cureus.50309
2. Mohajeri E., Mayel M., Nejad M., Khabaz M., & Bazrafshani M. Intranasal midazolam sedation as an effective sedation route in pediatric patients for radiologic imaging in the emergency ward: a single-masked randomized trial. Turkish Journal of Emergency Medicine 2020; 20(4):168-174. https://doi.org/10.4103/2452-2473.297461
3. Ali M., George J., & Deepak S... Comparison of intranasal dexmedetomidine and midazolam as premedication on haemodynamic stability. International Journal of Health Sciences 2022:13018-13027. https://doi.org/10.53730/ijhs.v6ns2.8426
4. Prasad M., Shobharani S., Kumar P., Girish B., Durairaju A., & Andiappan A. Comparative evaluation of atomized intranasal midazolam and intranasal ketamine as sedative premedication in children for child-parent separation. International Journal of Health Sciences 2022:14292-14300. https://doi.org/10.53730/ijhs.v6ns2.8793
5. Jain S., Patel S., Arora K., & Sharma A... A comparative study on the effectiveness of parental presence versus sedative premedication for reducing anxiety in children undergoing general anesthesia. International Journal of Applied and Basic Medical Research 2023; 13(2):101-105. https://doi.org/10.4103/ijabmr.ijabmr_636_22
6. Lang B., Wang H., Fu Y., Zeng L., Huang L., Zhang Q.et al.. Efficacy and safety of intranasal midazolam versus intranasal ketamine as sedative premedication in pediatric patients: a meta-analysis of randomized controlled trials. BMC Anesthesiology 2022; 22(1). https://doi.org/10.1186/s12871-022-01892-2
7. Ahmed A., Daak L., Alayidh M., Filfilan R., Alathath R., Rehbini A.et al.. The role of preoperative virtual reality for anxiety reduction in pediatric surgical patients: a systematic review and meta-analysis. Cureus 2025. https://doi.org/10.7759/cureus.77077
8. Dehghan F., Jalali R., & Bashiri H.. The effect of virtual reality technology on preoperative anxiety in children: a Solomon four-group randomized clinical trial. Perioperative Medicine 2019;8(1). https://doi.org/10.1186/s13741-019-0116-0
9. Ryu J., Ko D., Han J., Park J., Shin A., Han S.et al.. The proper timing of virtual reality experience for reducing preoperative anxiety of pediatric patients: a randomized clinical trial. Frontiers in Pediatrics 2022;10. https://doi.org/10.3389/fped.2022.899152
10. Yousef A., Eid G., Messbah W., & Azzam E.. The effect of intranasal dexmedetomidine premedication in children undergoing adenotonsillectomy suffering from recent mild upper respiratory tract infection. International Journal of Medical Anesthesiology 2023;6(4):01-07. https://doi.org/10.33545/26643766.2023.v6.i4a.427
11. Kaur T., Kumar P., Kundra T., & Kaur I. Comparison of intranasal midazolam-fentanyl with dexmedetomidine–fentanyl as premedication in the paediatric age group. The Indian Journal of Medical Research 2023;157(1):51-56. https://doi.org/10.4103/ijmr.ijmr_759_20
12. Alp H., Elmacı A., Esma K., & Say B.. Comparison of intranasal midazolam, intranasal ketamine, and oral chloral hydrate for conscious sedation during paediatric echocardiography: results of a prospective randomised study. Cardiology in the Young 2019;29(09):1189-1195. https://doi.org/10.1017/s1047951119001835
13. Palmese S., Bilancio G., Caterino V., Anseris A., Perciato S., Siglioccolo A., et al. Combination of intranasal dexmedetomidine and midazolam for sedation in pediatric magnetic resonance imaging. Pediatric Emergency Care 2023;40(6):430-433. https://doi.org/10.1097/pec.0000000000003086
14. Gupta A., Gupta H., Jamwal A., & Gulati S.. Comparative evaluation of midazolam and clonidine as premedicants in children undergoing elective orodental surgeries: a randomized, double blind trial. Iar Journal of Anaesthesiology and Critical Care 2022;03(01):1-5. https://doi.org/10.47310/iarjacc.2022.v03i01.002
15. Swaminathan K., Shan S., SS M., Renugalakshmi A., Ravi R., & Haridoss S.. Efficacy of intranasal sedation for pediatric dental procedures: a systematic review and meta-analysis. Journal of Dental Anesthesia and Pain Medicine 2025;25(1):1. https://doi.org/10.17245/jdapm.2025.25.1.1
16. Annan B., Darkwa E., Anno A., Vanderpuye N., Baffour-Awuah L., Adjei G.et al.. Appropriateness and safety of using the intranasal route for sedation during pediatric computed tomography: a randomized controlled trial at Korle-Bu Teaching Hospital. Journal of International Medical Research 2025;53(7). https://doi.org/10.1177/03000605251357455
17. Nie J., Chen C., Xie J., & Ding G. Oral midazolam vs. intranasal dexmedetomidine plus oral midazolam for sedation of pediatric outpatients: a double-blinded randomized controlled trial. BMC Anesthesiology 2023;23(1). https://doi.org/10.1186/s12871-023-02289-5
18. Yıldırım M., Ülgey A., Talıh G., Doğan H., & Güneş I. Evaluation of the perioperative effects of dexmedetomidine and midazolam-ketamine premedication in strabismus surgery. Journal of Pediatric Ophthalmology & Strabismus 2023;60(6):427-434. https://doi.org/10.3928/01913913-20221219-01
19. Cai Y., Wang C., Li Y., Chen J., Li J., Wu J.et al.. Comparison of oral midazolam and intranasal dexmedetomidine effects on preoperative sedation and anesthesia induction in children undergoing surgeries. Frontiers in Pharmacology 2021;12. https://doi.org/10.3389/fphar.2021.648699.