International Journal of Science and Research (IJSR)
ISSN: 2319-7064
Impact Factor 2025: 7.089

Effect of Intraoperative Music Therapy on the Haemodynamics and Post-Operative Pain in Elective Surgeries Under General Anaesthesia

Dr. Suparna Goel[1], Dr. Christina George[2]

Abstract: ***Background**: Perioperative anxiety and pain contribute significantly to haemodynamic instability and postoperative discomfort. Music therapy has may help to improve perioperative outcomes. **Objective**: To evaluate intraoperative music therapy on haemodynamic parameters, analgesic requirements, postoperative pain, and PONV during elective surgery under general anaesthesia. **Methods**: The prospective, randomized, single-blinded study was conducted at Christian Medical College and Hospital, Ludhiana, Punjab, from May 2023 to October 2024. Seventy ASA I–II adults undergoing elective surgery were randomized to music therapy (n=35) or control (n=35). The intervention group received intraoperative music through noise-cancelling headphones; controls wore identical headphones without music. Haemodynamic parameters and narcotic requirements were recorded. Postoperative pain was assessed using the Visual Analogue Scale (VAS), with rescue analgesic use and PONV recorded. **Results**: The music group had significantly lower intraoperative heart rate, systolic and diastolic blood pressure, and respiratory rate ($p<0.05$). Additional narcotic requirements were lower at 10 and 20 minutes. Postoperative VAS scores were lower (median 3 vs. 6; $p=0.0003$), with reduced rescue analgesic use (42.86% vs. 74.29%; $p=0.008$) and PONV (14.29% vs. 57.14%; $p=0.0002$). **Conclusion**: Intraoperative music therapy improves haemodynamic stability, reduces analgesic requirements, postoperative pain, and PONV incidence, supporting its use as a safe, cost-effective perioperative adjunct.*

Keywords: Music therapy; General anaesthesia; Haemodynamics; Postoperative pain; Analgesic requirement; Postoperative nausea and vomiting

1. Introduction

Pain and anxiety are fundamental concerns in the perioperative period and have a significant impact on surgical outcomes, particularly in patients undergoing general anaesthesia. Postoperative pain and perioperative stress remain significant challenges in surgical care, particularly in India where elective surgeries are increasingly common across diverse healthcare settings. [1]

Music therapy, defined as the clinical use of music interventions to accomplish individualized goals, has demonstrated potential benefits across various stages of surgical care. Particularly during general anaesthesia, where patients remain unconscious, music is hypothesized to exert subconscious effects, modulating stress responses, stabilizing haemodynamics, and attenuating pain perception.

The analgesic benefits of music therapy are equally compelling. Vazhakalayil and Varma (2024) found that patients undergoing abdominal surgery reported significantly lower pain scores and required less analgesia when exposed to perioperative music. [2]

Beyond pain relief, music therapy has shown promise in reducing perioperative stress and anxiety. Shukla et al. (2024) demonstrated that intraoperative music significantly reduced serum cortisol and immunoglobulin A levels- biomarkers of stress- alongside decreased sedative requirements. [3] Kaur et al. (2024) supported these findings, noting improved sedation profiles and reduced anxiety scores among women undergoing cesarean section. [4]

The favorable effect of music on postoperative satisfaction has also been documented. Zhang et al. (2024) observed higher satisfaction rates and lower anxiety scores in elderly patients receiving intraoperative music during orthopedic surgery, [5] while Shah and Sindhuja (2018) highlighted prolonged analgesia and better hemodynamic profiles in geriatric patients. [6]

Despite these positive findings, some studies like those by Kalyani et al. (2015) suggest that the impact of intraoperative music on hemodynamics may not always reach statistical significant, highlighting the need for further research across varied surgical populations and settings. [7]

The study was conducted to study the effect of intraoperative music therapy on the haemodynamics and post-operative pain in elective surgeries under general anaesthesia.

2. Literature Survey

Music therapy has established itself as a significant intervention in clinical settings, grounded in its potential to impact both psychological and physiological processes beneficially. This therapy involves the structured use of music by trained professionals to support various patient- centered goals, including reducing anxiety, alleviating pain, and enhancing emotional well-being. The therapeutic application of music in medical environments has been backed by substantial research, indicating its value across a wide range of medical fields, including psychiatry, oncology, and perioperative care. [8] Music therapy's foundations rest on the concept that auditory stimulation can modify neural and hormonal pathways associated with stress, anxiety, and pain, thereby offering non-pharmacological benefits complementary to conventional treatment modalities. [9]

3. Materials and Methods

The prospective, randomized, single-blinded observational study was conducted at the Christian Medical College and Hospital, Ludhiana, Punjab, over a period of 18 months (May

1, 2023- October 31, 2024) after receiving ethical clearance from the Institutional Ethics Committee. Using a block randomization technique, a total of 60 patients fulfilling the inclusion criteria were selected for the study. The study was conducted in accordance to the Declaration of Helsinki.

Inclusion Criteria

Aged between 18 and 70 years, undergoing elective surgery under general anaesthesia, classified as American Society of Anaesthesiologists (ASA) Physical Status I or II, scheduled for surgeries with an expected duration of no more than three hours, ready to provide written informed consent.

Exclusion Criteria

Patients with any degree of hearing impairment, ear trauma, facial trauma, or head trauma, with a history of mental retardation, psychiatric disorders, memory disorders, or neurological diseases, scheduled for neurosurgical interventions, any contraindications to the standard anaesthetic protocol used in the study.

Procedure

The study commenced with a comprehensive preoperative evaluation, including detailed medical history, physical examination, baseline vital signs, and recording of the Observer Assessment of Alertness/Sedation (OAAS) score. After obtaining written informed consent, patients were randomised into Group A or Group B using block randomization.

Anaesthesia was induced with intravenous Propofol (2 mg/kg) and Fentanyl (2 µg/kg), followed by Atracurium (0.5 mg/kg) for muscle relaxation. Following endotracheal intubation and controlled ventilation, anaesthesia was maintained with an inhalational agent titrated to achieve an appropriate minimal alveolar concentration. In Group A, intraoperative music therapy was initiated immediately after induction using noise-cancelling headphones (JBL Tune 760NC) with music played at 50% volume throughout surgery and continued until one hour post-extubation. Group B patients wore identical headphones without music. Heart rate, blood pressure, and respiratory rate were recorded at 10-minute intervals throughout surgery, and the requirement for additional sedative or analgesic agents was documented.

At the end of surgery, neuromuscular blockade was reversed with Neostigmine (0.05 mg/kg) and Glycopyrrolate (0.01 mg/kg) after confirmation of reflex recovery. Patients were extubated and transferred to the post-anaesthesia care unit (PACU), where headphones were removed one hour after arrival. Postoperative pain was assessed using the Visual Analogue Scale (VAS) on PACU admission and one hour postoperatively. The incidence of postoperative nausea and vomiting (PONV) and the requirement for rescue analgesia were also recorded.

Data collection was conducted through a predesigned and structured proforma and statistical analysis was conducted using the SPSS version 28.0. Descriptive statistics, including mean, standard deviation were calculated for continuous and percentages, were calculated categorical variables. Prior to performing comparative analyses, the normality of the continuous data was assessed using the Kolmogorov-Smirnov test. A p-value of less than 0.05 was considered indicative of statistical significance.

4. Result

Table 1: Baseline Characteristics of Study Participants

Variable	Cases (n=35)	Controls (n=35)	Total (n=70)	p-value
Age (years)				
18–30 years	19 (54.29%)	15 (42.86%)	34 (48.57%)	0.626
31–50 years	6 (17.14%)	8 (22.86%)	14 (20.00%)	
51–70 years	10 (28.57%)	12 (34.29%)	22 (31.43%)	
Mean ± SD	35.97 ± 15.99	43.20 ± 15.38	39.59 ± 16.00	0.058
Gender				
Male	17 (48.57%)	21 (60.00%)	38 (54.29%)	0.337
Female	18 (51.43%)	14 (40.00%)	32 (45.71%)	
ASA Grade				
ASA I	13 (37.14%)	17 (48.57%)	30 (42.86%)	0.334
ASA II	22 (62.86%)	18 (51.43%)	40 (57.14%)	
Type of Surgery				
General Surgery	15 (42.86%)	15 (42.86%)	30 (42.86%)	0.437
Gynaecology	1 (2.86%)	4 (11.43%)	5 (7.14%)	
Orthopaedics	19 (54.29%)	16 (45.71%)	35 (50.00%)	

Values are presented as number (%) or mean ± standard deviation. p-values were calculated using Chi-square/Fisher's exact test for categorical variables and independent t-test for continuous variables.

Compared to controls, cases had comparable distribution of age: 18 to 30 years (54.29% in cases vs. 42.86% in controls), 31 to 50 years (17.14% vs. 22.86%) and 51 to 70 years (28.57% vs. 34.29%) (p value = 0.626). Mean ± SD age in cases was 35.97 ± 15.99 years vs. 43.2 ± 15.38 years in controls, with no significant difference between them (p value = 0.058).

Similarly, the gender distribution was comparable, with no significant difference in the proportion of males and females between the two groups (p = 0.337). The types of surgeries performed, including general surgery, gynaecological procedures, and orthopaedic surgeries, were also evenly distributed across the groups (p = 0.437). No significant difference was observed in ASA physical status classification (p = 0.334), with ASA Grade II patients representing the majority of participants in both groups

(57.14%), reflecting a predominance of patients with mild systemic disease. The types of surgeries performed, including general surgery, gynaecological procedures, and orthopaedic surgeries, were also evenly distributed across the groups (p = 0.437).

Table 2: Comparison of Intraoperative Heart Rate Between Cases and Controls

Heart Rate (beats/min)	Cases (n=35) Mean ± SD	Controls (n=35) Mean ± SD	Total Mean ± SD	p-value
Pre-anaesthetic check-up	82.29 ± 5.42	82.51 ± 5.27	82.40 ± 5.31	0.859
At 0 minute	79.29 ± 4.98	86.31 ± 7.76	82.80 ± 7.38	<0.0001
At 10 minutes	76.94 ± 5.27	86.20 ± 6.43	81.57 ± 7.47	<0.0001
At 20 minutes	74.17 ± 4.46	84.20 ± 7.35	79.19 ± 7.87	<0.0001
At 30 minutes	75.74 ± 4.60	82.86 ± 6.08	79.30 ± 6.44	<0.0001
At 40 minutes	74.57 ± 3.48	82.49 ± 6.56	78.53 ± 6.56	<0.0001
At 50 minutes	75.11 ± 4.41	82.54 ± 6.15	78.83 ± 6.50	<0.0001
At 60 minutes	74.69 ± 3.89	81.57 ± 5.89	78.13 ± 6.05	<0.0001
At 70 minutes	76.33 ± 4.54	83.00 ± 4.61	80.14 ± 5.62	<0.0001
At 80 minutes	73.61 ± 4.82	82.50 ± 5.91	78.69 ± 7.00	<0.0001
At 90 minutes	74.18 ± 4.10	82.92 ± 5.54	79.29 ± 6.58	<0.0001
At 100 minutes	75.18 ± 4.23	82.00 ± 5.72	79.17 ± 6.13	0.0002
At 110 minutes	76.94 ± 5.09	83.83 ± 5.93	80.98 ± 6.51	0.0004
At 120 minutes	77.53 ± 5.69	83.25 ± 6.41	80.88 ± 6.69	0.005

Values are expressed as Mean ± Standard Deviation. p-values were calculated using the Independent t-test. A p-value <0.05 was considered statistically significant.

Baseline heart rates were comparable between the groups (p = 0.859). However, the music therapy group demonstrated significantly lower heart rates than the control group at all intraoperative time points from induction to 120 minutes (p < 0.05). This sustained reduction in heart rate suggests that intraoperative music therapy attenuated the sympathetic stress response and contributed to improved haemodynamic stability during surgery.

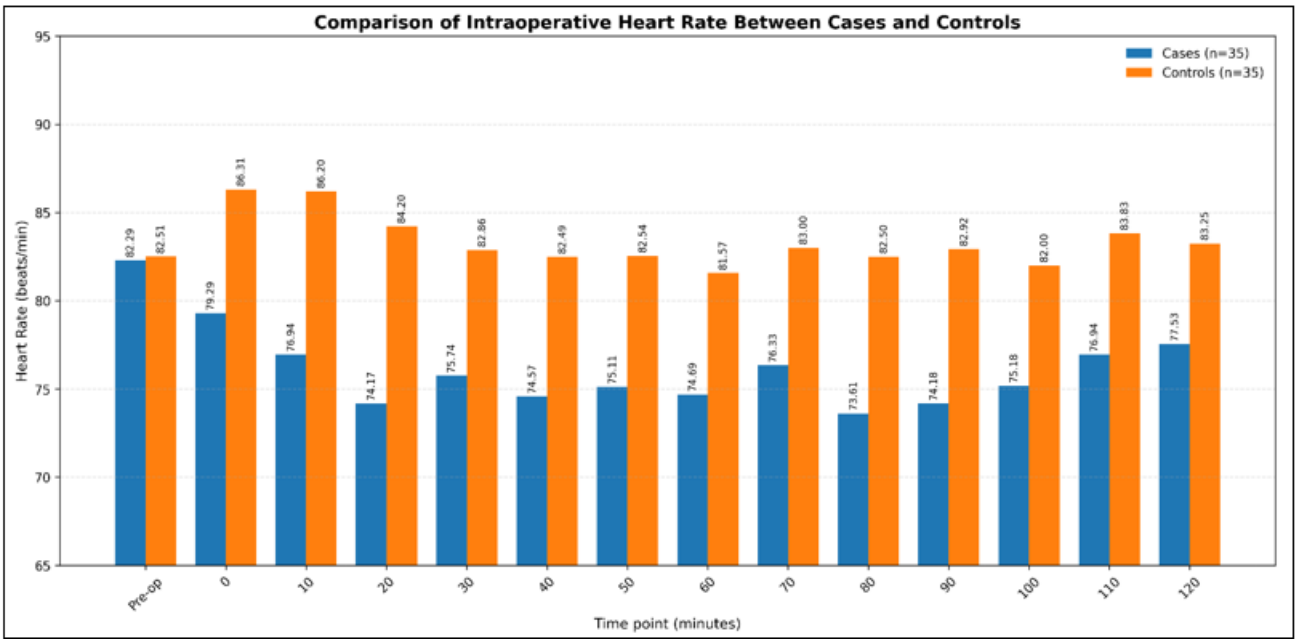


Table 3: Comparison of Intraoperative Blood Pressure Between Cases and Controls

Time Interval	Systolic Blood Pressure (mmHg) Mean ± SD	p-value	Diastolic Blood Pressure (mmHg) Mean ± SD	p-value
	Cases	Controls		Cases
Pre-anaesthetic check-up	125.43 ± 9.92	128.11 ± 10.05	0.264	78.51 ± 6.55
0 min	126.69 ± 9.47	137.49 ± 11.60	<0.0001	80.46 ± 5.72
10 min	124.46 ± 9.56	138.46 ± 12.27	<0.0001	78.09 ± 5.87
20 min	121.49 ± 8.91	136.23 ± 11.39	<0.0001	75.80 ± 7.47
30 min	121.09 ± 8.59	135.26 ± 8.80	<0.0001	75.46 ± 5.22
40 min	120.14 ± 7.32	133.80 ± 9.37	<0.0001	74.09 ± 5.47
50 min	121.26 ± 7.82	133.54 ± 10.81	<0.0001	74.63 ± 4.04
60 min	121.51 ± 8.08	134.34 ± 9.63	<0.0001	75.83 ± 5.06
70 min	121.22 ± 7.20	135.17 ± 7.78	<0.0001	76.61 ± 5.97
80 min	122.00 ± 7.36	135.25 ± 7.07	<0.0001	76.83 ± 4.95

90 min	121.18 ± 7.49	135.96 ± 8.34	<0.0001	76.12 ± 5.72
100 min	121.06 ± 6.71	134.83 ± 8.90	<0.0001	75.65 ± 5.53
110 min	123.71 ± 6.91	134.25 ± 8.63	0.0002	77.82 ± 5.05
120 min	123.94 ± 7.25	135.04 ± 7.41	<0.0001	78.18 ± 5.46

Values are expressed as Mean ± SD. p-values were calculated using the Independent t-test.

Baseline systolic and diastolic blood pressures were comparable between the groups (p>0.05). However, from induction onwards, the music therapy group demonstrated significantly lower systolic and diastolic blood pressure values than the control group at all intraoperative time points (p<0.05). These findings indicate that intraoperative music therapy effectively attenuated the haemodynamic response to surgical stress and contributed to greater cardiovascular stability during general anaesthesia.

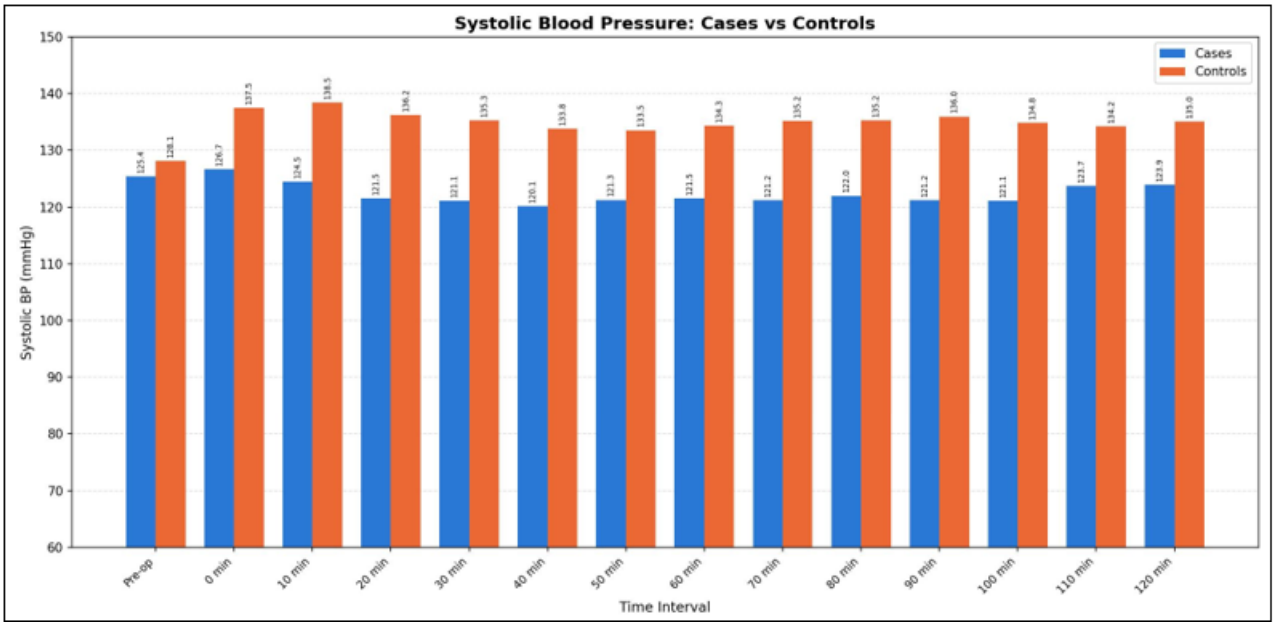


Table 4: Comparison of Intraoperative Respiratory Rate and Additional Narcotic Requirement Between Cases and Controls

Time Interval	Respiratory Rate (per minute) Cases Mean ± SD	Respiratory Rate (per minute) Controls Mean ± SD	p-value	Additional Narcotics Required Cases n (%)	Additional Narcotics Required Controls n (%)	p-value
Pre-anaesthetic check-up	16.66 ± 1.37	17.00 ± 1.37	0.299	–	–	–
0 min	16.54 ± 0.95	17.06 ± 0.94	0.026	1 (2.86)	1 (2.86)	1.000
10 min	16.34 ± 0.73	17.03 ± 1.01	0.002	1 (2.86)	10 (28.57)	0.006
20 min	16.31 ± 0.68	16.97 ± 0.95	0.002	0 (0.00)	7 (20.00)	0.011
30 min	16.29 ± 0.86	16.94 ± 0.87	0.002	1 (2.86)	4 (11.43)	0.356
40 min	16.14 ± 0.77	16.77 ± 0.69	0.0006	0 (0.00)	3 (8.57)	0.239
50 min	16.26 ± 0.70	16.74 ± 0.82	0.009	0 (0.00)	4 (11.43)	0.114
60 min	16.09 ± 0.61	16.71 ± 0.79	0.0004	0 (0.00)	1 (2.86)	1.000
70 min	15.94 ± 0.64	16.79 ± 0.78	0.0004	0 (0.00)	2 (8.33)	0.498
80 min	15.94 ± 0.64	16.67 ± 0.70	0.001	0 (0.00)	1 (4.17)	1.000
90 min	15.94 ± 0.66	16.71 ± 0.75	0.001	0 (0.00)	2 (8.33)	0.502
100 min	15.88 ± 0.60	16.79 ± 0.78	0.0001	0 (0.00)	2 (8.33)	0.502
110 min	16.00 ± 0.35	16.75 ± 0.79	0.0003	0 (0.00)	1 (4.17)	1.000
120 min	16.06 ± 0.43	16.71 ± 0.81	0.002	0 (0.00)	1 (4.17)	1.000

Values are expressed as Mean ± SD or n (%). Respiratory rate comparisons were performed using the Independent t-test, while additional narcotic requirements were compared using Fisher's exact test.

Baseline respiratory rates were comparable between the groups (p = 0.299). During surgery, the music therapy group demonstrated significantly lower respiratory rates than the control group at all intraoperative time points (p < 0.05), indicating reduced physiological stress. Additionally, the requirement for supplemental narcotics was lower in the music therapy group, with statistically significant differences observed at 10 minutes (p = 0.006) and 20 minutes (p = 0.011). These findings suggest that intraoperative music therapy attenuated the stress response and reduced the need for additional analgesic supplementation during surgery.

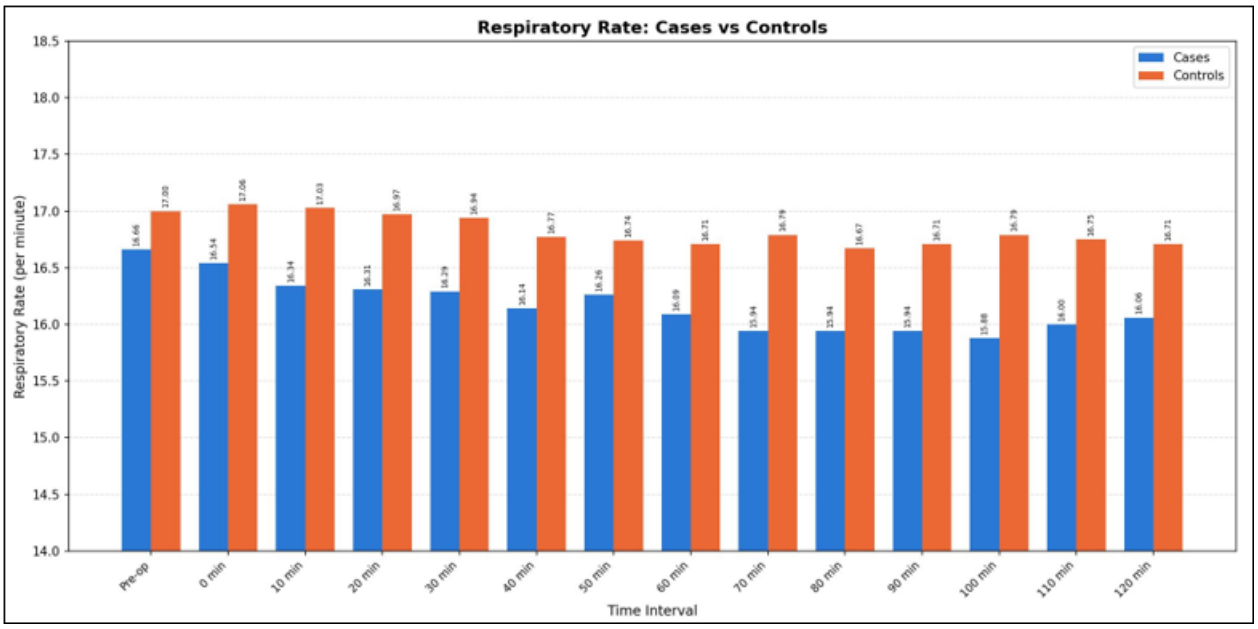


Table 5: Comparison of post-operative visual analog scale between cases and controls

Visual analog scale	Cases(n=35)	Controls(n=35)	Total	P value
Mean ± SD	3.71 ± 2.05	5.49 ± 1.17	4.6 ± 1.88	0.0003§
Median (25th- 75th percentile)	3(2-5.5)	6(5-6)	5(3-6)	
Range	1-7	3-7	1-7	

§ Mann Whitney test

Median (25th–75th percentile) visual analog scale score was significantly lower in cases (3 [2–5.5]) compared to controls (6 [5–6]) (p value = 0.0003)

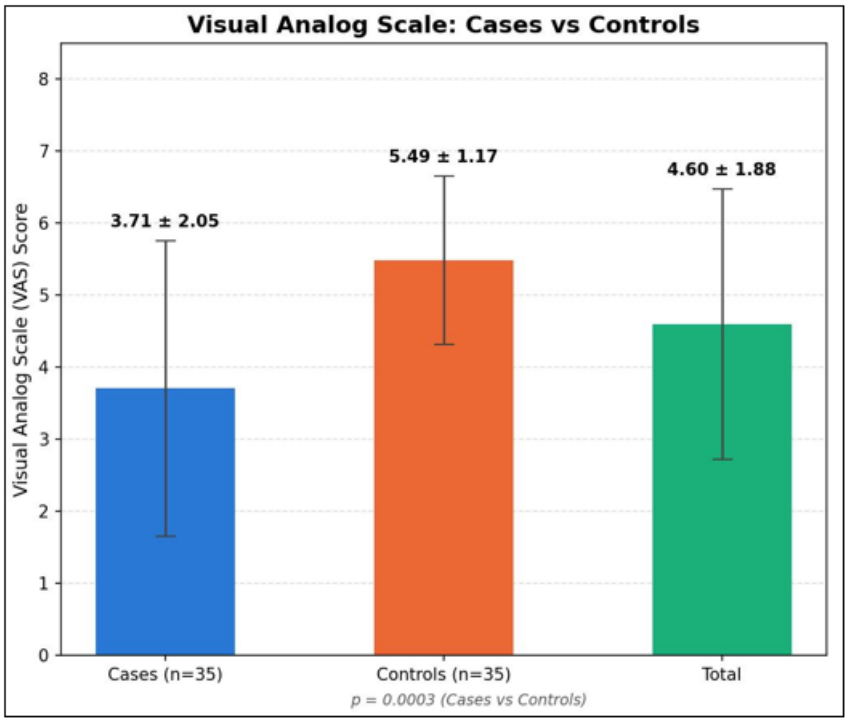


Table 6: Comparison of post-operative narcotics and analgesia given between cases and controls

Narcotics and analgesia given	Cases (n=35)	Controls (n=35)	Total	P value
No	20 (57.14%)	9 (25.71%)	29 (41.43%)	0.008†
Yes	15 (42.86%)	26 (74.29%)	41 (58.57%)	
Total	35 (100%)	35 (100%)	70 (100%)	

† Chi square test

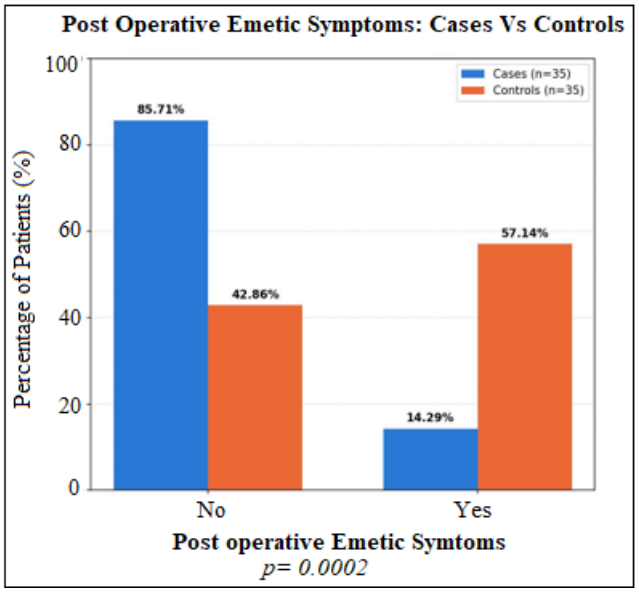
Cases had significantly lower proportion of post-operative narcotics and analgesia requirement as compared to controls (p value = 0.008)

Table 7: Comparison of Postoperative Recovery Outcomes Between Cases and Controls

Variable	Cases (n=35)	Controls (n=35)	Total (n=70)	p-value
Postoperative Emetic Symptoms				
No	30 (85.71%)	15 (42.86%)	45 (64.29%)	0.0002†
Yes	5 (14.29%)	20 (57.14%)	25 (35.71%)	
OAAS Score				
Mean ± SD	5.00 ± 0.00	5.00 ± 0.00	5.00 ± 0.00	1.000‡
Median (25th–75th percentile)	5 (5–5)	5 (5–5)	5 (5–5)	
Range	5–5	5–5	5–5	

† Chi-square test
‡ Independent t-test
Values are expressed as n (%) or Mean ± SD. A p-value <0.05 was considered statistically significant.

Postoperative recovery outcomes were more favourable in the music therapy group. The incidence of postoperative emetic symptoms was significantly lower among patients receiving intraoperative music therapy compared with controls (14.29% vs. 57.14%, p = 0.0002). However, OAAS scores were identical in both groups (5.0 ± 0.0, p = 1.000), indicating



5. Discussion

The aim of this study was to evaluate the effect of intraoperative music therapy on hemodynamic stability and postoperative pain management in patients undergoing elective surgeries under general anesthesia. Specifically, the study sought to determine whether the use of music as an adjunct to standard anesthetic techniques could lead to significant improvements in intraoperative blood pressure, heart rate, and respiratory rate, as well as a reduction in postoperative pain scores and the requirement for additional analgesics.

The demographic and clinical characteristics were comparable between the music therapy and control groups, with no statistically significant differences in age, sex distribution, ASA grade, type of surgery, or duration of surgery. This baseline homogeneity minimizes potential confounding factors and strengthens the internal validity of the study. Similar demographic matching was reported by

complete alertness and comparable recovery from sedation. These findings suggest that while intraoperative music therapy significantly reduced postoperative nausea and vomiting, it did not adversely affect postoperative alertness or recovery status.

Kalyani et al. [7], Wang et al. [10], and Kahloul et al. [11], who emphasized that balanced baseline characteristics are essential for accurately evaluating the effects of perioperative music interventions. Therefore, the differences observed in intraoperative and postoperative outcomes in the present study are likely attributable to the music intervention rather than demographic or clinical disparities.

Patients exposed to intraoperative music demonstrated significantly lower heart rates throughout surgery compared with controls, suggesting attenuation of the sympathetic stress response. Music has been shown to influence autonomic nervous system activity by enhancing parasympathetic tone and reducing anxiety. Similar reductions in intraoperative heart rate were reported by Kahloul et al. [11], and Singh et al. [12], who observed improved cardiovascular stability among patients receiving music therapy. These findings support the role of music as a simple non-pharmacological adjunct for reducing perioperative physiological stress.

Intraoperative systolic and diastolic blood pressures were significantly lower in the music therapy group, indicating superior hemodynamic stability. Music is believed to reduce catecholamine release and sympathetic activation, thereby attenuating stress-induced cardiovascular responses. Comparable findings were reported by Kahloul et al. [11], Shah and Sindhuja [6], and Wang et al. [10], who demonstrated improved blood pressure control among patients exposed to music during surgical procedures. The sustained reduction in blood pressure observed in the present study highlights the beneficial effect of music on perioperative cardiovascular regulation.

The music therapy group exhibited lower respiratory rates and required significantly fewer supplemental sedatives and analgesics intraoperatively. Reduced respiratory rate may reflect lower anxiety levels and improved autonomic stability. Furthermore, decreased requirements for additional fentanyl or sedative agents suggest an opioid- and sedative-sparing effect of music therapy. Similar observations were reported by Bakı et al. [13], Gökçek and Kaydu [14], and Kalyani et al. [9], who noted reduced anesthetic and analgesic

consumption among patients receiving music interventions. These findings support the incorporation of music therapy as an adjunct to multimodal perioperative care.

Postoperative pain scores were significantly lower in patients exposed to intraoperative music, indicating a sustained analgesic benefit extending beyond the operative period. Music may alter pain perception through distraction, emotional modulation, and activation of endogenous analgesic pathways. Comparable reductions in postoperative pain scores have been reported by Wang et al. [10], Varbanova et al. [15], Kahloul et al. [11], and Bagle et al. [16]. The present findings reinforce the growing evidence supporting music therapy as an effective complementary strategy for postoperative pain management.

Patients in the music therapy group required fewer rescue analgesics and demonstrated a reduced overall postoperative analgesic requirement. These findings provide objective evidence that the reduction in pain scores translated into clinically meaningful analgesic benefits. Similar reductions in postoperative analgesic consumption were documented by Varbanova et al. [15], and Bagle et al. [16]. Reduced analgesic use may contribute to fewer medication-related adverse effects and facilitate enhanced postoperative recovery.

Music therapy was associated with a lower incidence of postoperative nausea and vomiting (PONV) and improved overall recovery outcomes. The reduction in PONV may be secondary to decreased perioperative stress, lower opioid consumption, and improved autonomic balance. Similar findings were reported by Wang et al. [10], Kahloul et al. [11], and Gökçek and Kaydu [14], who observed improved postoperative comfort and recovery among patients receiving music interventions. Collectively, these findings suggest that intraoperative music therapy provides benefits beyond analgesia by enhancing overall postoperative well-being and patient recovery.

The strengths of this study include its randomized controlled design, well-matched baseline characteristics, and comprehensive assessment of both objective haemodynamic parameters and subjective pain outcomes. Standardized perioperative protocols and repeated measurements at multiple time points enhanced the reliability and internal validity of the findings. However, the study was limited by its single-centre setting and relatively small sample size, which may restrict generalizability. The absence of advanced depth-of-anaesthesia monitoring, such as bispectral index (BIS), may have introduced subjectivity in sedation assessment. Additionally, only short-term perioperative outcomes were evaluated, and potential underlying mechanisms of music therapy were not explored. Further large-scale multicentre studies involving diverse surgical populations and long-term follow-up are warranted.

6. Conclusion

Intraoperative music therapy significantly improved perioperative outcomes by promoting greater haemodynamic stability, evidenced by lower heart rate, blood pressure, and respiratory rate compared with controls. Patients exposed to music also demonstrated reduced intraoperative sedative/analgesic requirements, lower postoperative pain scores, decreased rescue analgesic consumption, and a lower incidence of postoperative nausea and vomiting. These findings suggest that music therapy effectively attenuates the surgical stress response and enhances postoperative recovery. As a simple, safe, low-cost, and non-pharmacological intervention, music therapy can be readily incorporated into routine perioperative care. Further large-scale multicentre studies are recommended to confirm these findings and evaluate their applicability across diverse surgical populations.

7. Future Scope

Future studies should include larger, multi-centre randomized trials to improve the generalizability of findings. Different surgical populations, music genres, and individualized music preferences should be evaluated to determine optimal therapeutic approaches. Long-term postoperative outcomes, patient satisfaction, and quality of recovery should be assessed in future research. Further investigation of the underlying neurophysiological mechanisms and the role of depth-of-anaesthesia monitoring is warranted.

References

[1] Vadhanan P, Tripaty DK, Balakrishnan K. Pre-operative anxiety amongst patients in a tertiary care hospital in India – a prevalence study. J Soc Anaesth Nepal. 2017;4(1):5–10.
[2] Vazhakalayil ST, Varma S. Effects of Music Therapy on Postoperative Pain Perception in Patients Undergoing Abdominal Surgeries Under General Anesthesia: A Prospective Controlled Randomized Comparative Clinical Study. Cureus. 2024;16.
[3] Shukla U, Yadav U, Kannan TK, Yadav J. Effect of Music Therapy on Anxiety, Stress and Sedative Requirements in Patients Undergoing Lower Limb Orthopedic Surgery Under Spinal Anesthesia: A Randomized Controlled Study. Cureus. 2024;16.
[4] Kaur H, Shukla V, Singhal R, Harsh H, Pareek R. The effect of intraoperative music on sedation, anxiety, and hemodynamic responses among patients undergoing lower segment cesarean section under spinal anesthesia. J Obstet Anaesth Crit Care. 2024; 14: 17-22.
[5] Zhang X, Deng C, Zhao H. Novel Approach for Investigating the Effect of Music Therapy on Perioperative Anxiety and Postoperative Satisfaction in Elderly Patients Undergoing Lower-Limb Fracture Surgery Under Intravertebral Anesthesia: A Prospective Clinical Study. Noise Health. 2024;26(122):312-9.
[6] Shah A, Sindhuja S. The Role of Music Therapy in Post-Operative Analgesia- Study in Elderly. Glob J Res Anal. 2018;5.
[7] Kalyani N, Poonam G, Shalini K. Impact of intraoperative music therapy on anesthetic requirement and stress response in laparoscopic surgeries. Ain-Shams J Anaesthesiol. 2015; 8: 580-4.
[8] Ciğerci Y, Özbayır T. The effects of music therapy on anxiety, pain and the amount of analgesics following

coronary artery surgery. Turkish journal of thoracic and cardiovascular surgery. 2016 Jan 4;24(1).

[9] Giordano F, Giglio M, Sorrentino I, Dell'Olio F, Lorusso P, Massaro M, Tempesta A, Limongelli L, Selicato L, Favia G, Varrassi G. Effect of preoperative music therapy versus intravenous midazolam on anxiety, sedation and stress in stomatology surgery: a randomized controlled study. Journal of Clinical Medicine. 2023 Apr 29;12(9):3215.

[10] Wang Y, Tang H, Guo Q, Liu J, Liu X, Luo J, et al. Effects of intravenous patient-controlled sufentanil analgesia and music therapy on postoperative pain and hemodynamics in lung cancer surgery. J Altern Complement Med. 2015;21(11):667-72.

[11] Kahloul M, Mhamdi S, Nakhli M, Sfeyhi AN, Azzaza M, Chaouch A, et al. Effects of music therapy under general anesthesia in abdominal surgery patients. Libyan J Med. 2016;12.

[12] Singh P, Arya A, Singh M, Prakash R, Khan M. Effect of spiritual music on hemodynamic parameters in elderly undergoing lower limb surgery. Anesth Essays Res. 2022; 16: 208-12.

[13] Bakı ED, Ulu Ş, Yüksek A, Arıcan H, Sıvacı R. Does listening to music during tonsillectomy affect sevoflurane consumption? Med Princ Pract. 2018; 27: 343-9.

[14] Gökçek E, Kaydu A. Effects of music therapy on hemodynamic parameters and awakening pain in elective septorhinoplasty. Braz J Otorhinolaryngol. 2019; 86: 419-26.

[15] Varbanova MR, Neamtu A, Gaar E, Grigorov MV, Louisville KY. Music reduces postoperative pain in male abdominal surgery patients. Int J Approx Reason. 2016; 4: 272-7.

[16] Bagle A, Phansalkar S, Gaur S. Effect of music therapy on hemodynamic parameters in spinal anesthesia for abdominal and lower limb surgeries. Med J Dr. DY Patil Vidyapeeth. 2023; 16: 232-6.