Music As An Alternative Therapy to Midazolam for Sedation in Patients Undergoing Elective Pelvic and Lower Limb Surgery Under Spinal Anesthesia

Murad Hameed Mola [*], **Aimen Hameed Latef** [**]

ABSTRACT:

BACKGROUND:

Almost in all types of surgical operations, patients experienced some kinds of anxiety which is reflected by a perceptible change in some vital signs. Music therapy is an emerging nonpharmacological intervention that had proven effectiveness in different medical conditions.

OBJECTIVE:

To assess the effect of music intervention on some vital signs in patients undergoing elective pelvic and lower limb surgery under spinal anesthesia.

PATIENTS AND METHODS:

A prospective randomized study was conducted including a total of 100 patients scheduled for elective pelvic and lower limb surgery under spinal anesthesia. Patients were randomly assigned into two equals groups: the intervention group, and non-music group. Spinal anesthesia was standardized to all patients. Patients in music group were given headphone set connected to CD player and listened to a soft music immediately after the induction of spinal anesthesia until the end of the operation. Patients in non-music group were given midazolam in divided doses each with 1 mg as required. Hemodynamic parameters and respiratory rate were recorded at the entrance of operating room and then 5, 10, 15, 20, 30, 40, 50 and 60-minute post anesthesia induction.

RESULTS:

During all the time period after anesthesia induction until the end of operation, there were no significant differences between intervention group and non-music group in the all included vital signs (heart rate, systolic pressure, diastolic pressure, and mean blood pressure).

CONCLUSION:

music intervention can be used as a nonpharmacological alternative midazolam to control the vital signs after spinal anesthesia.

KEYWORDS: Music therapy, Elective surgery, Spinal anesthesia.

INTRODUCTION:

Anesthesiologists are in charge of warranting the safety and relief of the patient before, during and after surgery, particularly within operation room. Almost all patients scheduled for surgery present with some degree of anxiety, usually starts at least 2 days before the operation [(1)]. Such anxiety increases in the operation room and is accompanied by fear, doubt, and desperation [(2)]. Accordingly, there will be an increases in respiratory and heart rate, blood pressure and plasma levels of adrenaline and noradrenalin.

To reduce the anxiety, different types of sedatives have become a routine practice [(3)]. The aim of this intervention is to bring the patient to a position where he/she can be safely and calmly undergone the anesthesia and surgical procedures. However, due to variation in the intraoperative conditions, and the different pharmacokinetics and pharmacodynamics properties of the sedatives, it is not easy to perform such a task [(4)].

Many previous studies have used music therapy to overcome patients' anxiety during surgical operation. Besides its anxiolytic and sedative effects, music intervention has been found to shorten the duration of postoperative recovery and reduce the need for analgesic drug. Furthermore, music therapy can improve the satisfaction in patients undergoing regional anesthesia [(5)].

*Al-Karkh General Hospital.
**Al-Yarmook Teaching Hospital.

Thus, this study aimed to assess the effect of music intervention before and during surgery on some vital signs in patients undergoing elective pelvic and lower limb surgery under spinal anesthesia.

PATIENTS AND METHODS:

The Study Population

A total of 100 patients scheduled for elective pelvic and lower limb surgery under spinal anesthesia in the Surgery Department/Al-Imamain Al-Kadhumain Medical City from 1st November, 2017 to 31st January 2018 were recruited for this prospective study. The participant age ranged from 18 to 65 years. They had an American Society of Anesthesiologists (ASA) physical status score of 1 or 2. This study was approved by the Iraqi council of Medical Specialization, and a written consent form was obtained from each participant before the enrollment in the study.

Patients having hearing impairment, hormonal dysfunction, psychiatric disorders, drug abusers, those on antihypertensive drugs, patients with allergy to drugs, those with contraindication for spinal anesthesia, and those who refused to participated in this trial were excluded from the study. Cases of failure of spinal anesthesia were dropped out of the study. Patients were randomly assigned into two equals groups each with 46 subjects: the intervention group, or music group (M), non-music group (NM). Demographic data including age, gender, height, weight and smoking status, as well as previous surgical experience were obtained by direct interview.

METHODS:

On arrival at operating theatre, the standard monitors: electrocardiogram (ECG), pulse oximeter ,and non-invasive blood pressure were attached, and the baseline values were recorded. Each patient was given 1 liter of preload fluid. Spinal anesthesia was standard to all patients using bupivacaine 0.05% at sitting position. The dose of bupivacaine was determined according to patient's weight and height.

Patients in M group were given headphone set connected to compact disc player and listened to a soft music immediately after the induction of spinal anesthesia until the end of the operation. They were instructed to close their eyes and relax their bodies. The volume of music was set to satisfy the patient's desire, compatible with prolonged listening without hearing risk. On the other hand, patients in NM group were administered midazolam in divided doses each with 1 mg as required, and patients were also given a head phone set and instructed to close their eyes in quiet surroundings and relax their bodies but without music.

Hemodynamic parameters (heart rate, systolic, diastolic and mean blood pressure) and respiratory rate were recorded at the entrance of operating room and then 5, 10, 15, 20, 30, 40, 50 and 60-minute post anesthesia induction.

Statistical Analysis

Data were analyzed by statistical package for social science (SPSS) software version 20. Categorical variables were expressed as frequency and percentage and analyzed with Chi square test. Continuous variables were represented as mean± standard deviation (SD). Two-way repeated measures analysis of variance (ANOVA) was used to analyze pulse rate systolic and diastolic blood pressure, mean blood pressure and respiratory rate over time. Bonferr's post-hoc was used for comparison between groups. independent t-test. A P-value of less than 0.05 was considered significant.

RESULTS:

Baseline Demographic and Clinical Characteristics of the Study Population

There were no significant differences in any of demographic and clinical characteristics between intervention group (M group) and control group (NM group) as shown in table 1. Even the total requirement of ephedrine, M group needed 13.7±2.9 mg in average versus 12.8±3.6 mg in NM group (P=0.409). Likewise, respiratory rate/ min and blood oxygen saturation were very close between the two groups.

Table 1: Demographic and clinical baseline of the study population.

Characteristics	Group M (50)	Group NM (50)	P-value
Age, years (mean±SD)	39.18±9.23	41.97±11.9	0.314
Gender, No (%) Male Female	 27(54%) 23(46%)	 31(62%) 19(38%)	 0.544
BMI (mean±SD)	26.8±1.9	24.7±2.1	0.441
ASA Physical status I Physical status II	 32(64%) 18(36%)	 30(60%) 20(40%)	 0.837
Duration of surgery (min)	56.2±9.22	58.7±12.6	0.383
Total ephedrine requirement, mg (mean±SD)	13.7±2.9	12.8±3.6	0.409
Respiratory rate/ min	19.8±3.7	21.1±2.9	0.231
SPO_2 (%)	96.3±11.2	97.8±12.1	0.119

SD: standard deviation, BMI: body mass index, ASA: American Society of Anesthesiologists, SPO_2: blood oxygen saturation.

Heart Rate

Figure 1 shows the heart rate in M and NM groups over the time. Generally, heart rate showed tachycardia in both groups during the first 20 minutes after anesthesia induction, after which there was a return to the baseline values. Interestingly, there were no significant differences between the two groups in heart rate over all the time period.

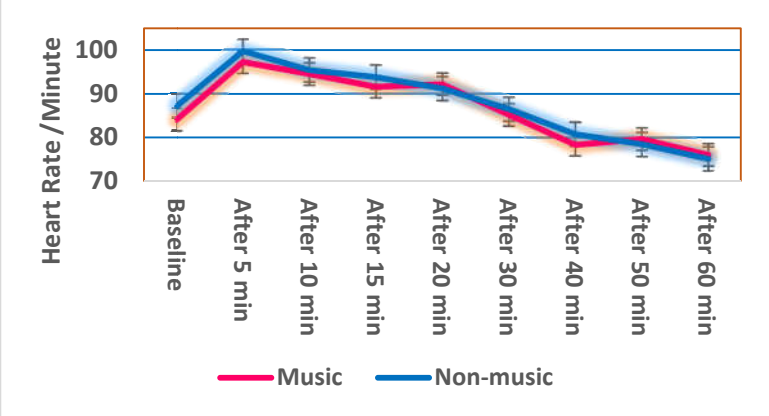

Figure 1: Variation in heart rate over time in the music and non-music intervention

Systolic Pressure

In both M and NM groups the systolic pressure dropped from baseline values all over the time period after anesthesia induction till the end of the operation. Although there were some variations between the two groups especially after 20 and 30 min after anesthesia induction, the differences were not significant (Figure 2).

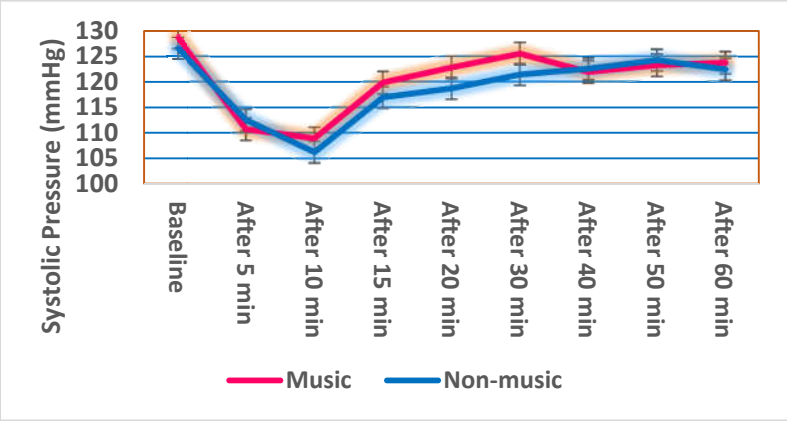

Figure 2: Variation in systolic pressure over time in the music and non-music intervention.

Diastolic Pressure

In similar manner to systolic pressure, the diastolic pressure dropped markedly 5 min after anesthesia induction until 20 min where it started to return to its baseline. This manner was seen in both group (Figure 3), and along all the time period from anesthesia induction till the end of operation, there were no significant differences between M and NM group.

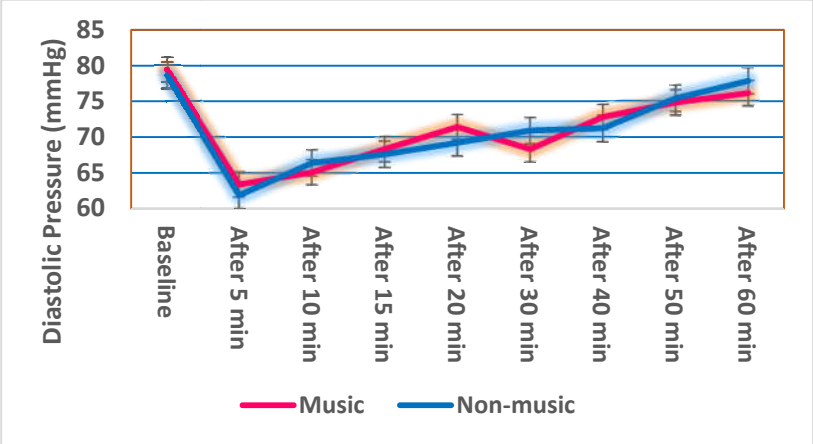

Figure 3: Variation in diastolic pressure over time in the music and non-music intervention.

Mean Blood Pressure

Mean blood pressure reflexes values of both systolic and diastolic blood pressure, and, as expected, it took similar manner to them. The highest difference between M group and NM group in mean blood pressure was at 30 min after anesthesia induction (84.4±8.5 mmHg vs. 80.9±8.9 mmHg). However, neither at this point nor in any other time period the difference was significant (Figure 4).

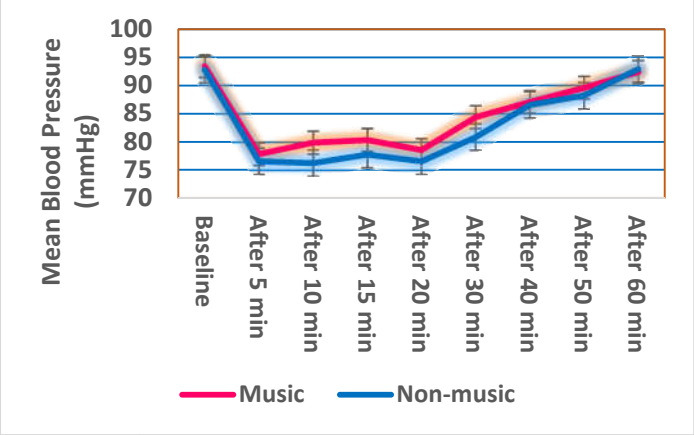

Figure 4: Variation in mean blood pressure over time in the music and non-music intervention.

DISCUSSION:

Patients in NM group had almost similar demographic and vital signs baseline to those who had music intervention. Thus, any differences in vital signs between the two group could be attributed to music intervention.

The current studies revealed comparable effect of the music therapy on hemodynamic parameters with that exerted by midazolam. These results are consistent with those reported by several studies that investigated the role of music therapy in patients in intensive care [6] and in patients to be operated on preoperatively [7] or in general paranesthesia [8] or during locoregional anesthesia [9]. Indeed, all these studies report that music therapy reduces anxiety. Chan [10] found that music therapy significantly affected SBP, DBP, HR, and SPO2 in patients undergoing a C-clamp procedure which is an emergency stabilization of instrument for fixation of unstable fractures in the pelvic bones. In India, Syal *et al.* [11] divided 100 patients intended to have abdominal surgery under general anesthesia into two groups; music intervention and controls. The authors recorded some hemodynamic parameters as well as the catecholamine levels in the serum. The study revealed significant decrease in heart rate, anxiety score and epinephrine levels in music group compared to controls.

Using spinal anesthesia, Sarkar *et al*. [12] conducted a study to see the effect of music in females undergoing caesarean section. They found that music-treated women had significantly low value in the respiratory rate, pulse rate, anxiety score compare to control women. However, there was no significant difference in systolic and diastolic blood pressure on completion of the surgery. Similarly, Lee *et al*. [13] investigated the effect of music therapy on 100 Taiwanese patients having different types of surgeries under spinal anesthesia. The study revealed that all studied physiological indices such HR, SBP, DBP and respiratory rate decreased with patient with patients who did not receive such intervention.

On the other hand, null associations were frequently recorded in other studies. Argstatter *et al.* [14] ,Sendelbach *et al.* [15], Forooghy *et al*. [16] , and Varbanova *et al.* [17].

The contradiction between the findings of different studies can be attributed to many factors, the most important of which is the time of intervention, type of surgery, type of anesthesia, music type, age, culture, socioeconomic status and may be the religion of the patients.

The current study is unique in that it evaluated the efficiency of music intervention in comparison with midazolam and revealed that this intervention is comparable with the effect of midazolam on hemodynamic parameters.

Many hypotheses have been postulated for the possible effect of music on anxiety and hemodynamic parameters. Basically, the stimulation of the sympathetic system by anxiety causes a rise in the heart rate and blood pressure which may have deleterious effects in certain situations. Listening to an appropriate relaxation music stimulates the limbic system in the brain

where the centers of emotion and sensations. This stimulation inhibits release of encephalins and endorphins and reduced by therefore the activity of the sympathetic system. The impact of music therapy may also be due to neurophysiological effects, specific to pain and music, acting on the components sensory (causing a counter-stimulation of afferent fibers), cognitive (diverting attention often creating images and moving thoughts away from pain), affective (modifying the mood associated with states such as the depression or anxiety and thereby decreasing tensions and feelings of anxiety) and behavioral (acting on muscle hypertonia and psychomotility) [18].

Alternatively, auditory interconnection with the hypothalamus, hippocampus as well as the ventricular activating system is supposed to reduce the production of excitatory neurotransmitters. For example, Menon and Levitin [19] reported an association between a pleasant music and the release of dopamine, and attributed that action to response in area in brain (the nucleus accumbens and the ventral tegmental area) to the music. Furthermore, in an experimental study, Sutoo and Akiyama [20] found that music therapy caused an increase in calcium/CaM-dependent dopamine synthesis in the brain, and that the subsequent increase in dopamine reduces some hemodynamic parameters via D2 receptors. Acceleration of calcium-dependent dopamine synthesis might thus be a mechanism by which music modifies the hemodynamic parameters as well as other brain functions.

CONCLUSION:

Music therapy could be used as a suitable non-invasive and non-pharmacological alternative for midazolam to decrease the efficiency of spinal anesthesia. Including music therapy as a complementary modality in pelvic and lower limb operations may increase the efficiency and safety of the operation through reduction the required doses of the sedative. Further studies are required in order to fortify the current evidence especially regarding the effect on different types of music on preoperative anxiety.

Acknowledgments:

The author is grateful to all staff member of all enrolled patients for their help and cooperation

Conflict of Interest

The author declares that they have no competing interests.

Funding: Self-funding

REFERENCES:

1. Gokcek E, Kaydu A. The effects of music therapy in patients undergoing septorhinoplasty surgery under general anesthesia. Brazilian J Otorhnolaryngol 2020;86:419-26.
2. Mohan B, Kumar R, Attri JP, Chatrath V, Bala N. Anesthesiologist's Role in Relieving Patient's Anxiety. Anesth Essays Res. 2017;11:449-52.
3. Sheen MJ, Chang F, Ho S. Anesthetic premedication: new horizon of an old practice. Acta Anaesthesiologica Taiwanica 2014;52:134-42.
4. Becker DE. Pharmacodynamic considerations for moderate and deep sedation. Anesth Prog. 2012;59:28-42.
5. Bringman H, Giesecke K, Thorne A, Bringman S. Relaxing music as pre-medication before surgery: a randomised controlled trial. Acta Anaesthesiol Scand 2009;53:759-64
6. Almerud S, Petersson K. Music therapy-a complementary treatment for mechanically ventilated intensive care patients. Intensive Crit Care Nurs 2003;19:21–30.
7. Wang S, Kulkarni L, Dolev J, *et al.* Music and preoperative anxiety: a randomized, controlled study. Anesth Analg 2002;94:1489–94.
8. Migneault B, Girard F, Albert C, et al. The effect of music on the neurohormonal stress response to surgery under general anesthesia. Anesth Analg 2005;98:527–32.
9. Lepage C, Drolet P, Girard M, *et al.* Music decreases sedative requirements during spinal anesthesia. Anesth Analg 2001;93: 912–16.
10. Chan MF. Effects of music on patients undergoing a C-clamp procedure after percutaneous coronary interventions: a randomized controlled trial. Heart Lung. 2007;36:431–39.
11. Syal K, Singh D, Verma R, *et al*. Effects of music therapy in relieving anxiety in patients undergoing surgery. Int J Anatomy, Radiol Surg 2017:1-4.
12. Sarkar D, Chakrabarty K, Bhadra B, *et al.* Effects of music on patients undergoing caesarean section under spinal anaesthesia. Recent Trends in Science and technology. 2015;13:633-37.
13. Lee W, Wu P, Lee M, *et al.* Music listening alleviates anxiety and physiological responses in patients receiving spinal anesthesia. Contem Ther Med 2017;31:8-13.

14. Argstatter H, Haberbosch W, Bolay HV. Study of the effectiveness of musical stimulation during intracardiac catheterization. Clin Res Cardiol. 2006;95:514–22.
15. Sendelbach SE, Halm MA, Doran KA, *et al.* Effects of music therapy on physiological and psychological outcomes for patients undergoing cardiac surgery. J Cardiovasc Nurs. 2006;21:194–200.
16. Forooghy M, Tabrizi EM, Hajizadeh E, *et al*. Effect of music therapy on patients' anxiety and hemodynamic parameters during coronary angioplasty: a randomized controlled trial. Nurs Midwifery Stud 2015;4:e25800.
17. Varbanova MR, Neamtu A, Gaar E, *et al.* Music reduces postoperative pain perception in male patients after abdominal surgery under general anesthesia. Int J Anesthesiol Res 2016;4:272-177.
18. Guetin S, Coudeyre E, Picot M, *et al.* Effect of music therapy among hospitalized patients with chronic low back pain: a controlled, randomized trial. Ann Readapt Med Phys 2005;48:217–24.
19. Menon V, Levitin DJ. The rewards of music listening: response and physiological connectivity of the mesolimbic system. NeuroImage 2005;28:175-184.
20. Sutoo D, Akiyama K. Music improves dopaminergic neurotransmission: demonstration based on the effect of music on blood pressure regulation. Brain Res 2004;1016:255-262.