

A Study to Evaluate the Effect of Music on Pain Intensity and Physiological Parameters among Post - Operative Cardiac Patients in AIIMS, New Delhi

Tarika¹, Ashia Qureshi², Shashi Mawar³, V Devagourou⁴

¹ Nursing Tutor, M.M College of Nursing, M. M. University, Haryana, India

² Lecturer, College of Nursing, All India Institute of Medical Sciences, New Delhi, India

³ Lecturer, College of Nursing, All India Institute of Medical Sciences, New Delhi, India

⁴ Additional Professor, Department. of C.T.V.S, All India Institute of Medical Sciences, New Delhi, India

Abstract: Cardiac surgery is associated with postoperative cutaneous, visceral, and deep somatic pain. Music as one of the complimentary alternative medical (CAM) therapy is a non pharmacological method that can be used to treat pain during post operative period. This RCT was undertaken with the aim to evaluate the effect of music on pain and physiological parameters among post-operative cardiac patients. 40 patients after cardiac surgery were randomly assigned to receive either music intervention with standard care practices (study group, n1=20) or standard care practices only (control group, n2=20) twice a day on 1st and 2nd post operative day. Pain intensity was measured using numerical rating scale and physiological parameters were recorded from the cardiac monitor. Patients were asked to give their remarks on music therapy after intervention. Results show no significant difference between study and control group in terms of pain intensity and physiological parameters. Significant reduction was seen before and after intervention in study group. Based on the scientific evidences it is concluded that CAM therapies should be thoughtfully used as not all CAM therapies work effectively during immediate post operative period when the patient is anxious about the prognosis.

Keywords: Music, Pain, Cardiac surgery, Physiological parameters and Post operative cardiac patients.

1. Introduction

Pain is a common and inevitable experience of surgery. Cardiac surgeries are no exception and patients generally experience acute pain after these surgeries. Inadequate pain management after cardiac surgery can lead to prolonged hospitalization and delayed recovery.¹ Even though patients get analgesics during post- operative period, still they complain of pain and refrain from self-care and functional activities. Variety of complementary alternative medical (CAM) therapies (e.g. music, massage, and guided imagery) have been used successfully to complement pain management.² Music therapy is a simple, safe, inexpensive and effective therapy in reducing potentially harmful physiological responses arising from pain in patients after heart surgeries.³

A number of studies have been conducted in developed countries regarding effect of non pharmacological methods on pain and physiological parameters whereas only a very few studies are conducted in developing countries including India. CAM has been proven to be effective in various areas of medical and nursing care so it is an effort to assess the effect of music as one of the CAM therapies on pain intensity and physiological parameters among post-operative cardiac patients. The objectives of the study were:

- 1) To compare the effect of music along with standard care practices vs. only standard care practices on pain intensity in post- operative cardiac patients.
- 2) To compare the effect of music along with standard care practices vs. only standard care practices on physiological parameters in post- operative cardiac patients.

2. Literature Survey

Jafari H, Zeydi A E, Khani S, Esmacili R and Soleimani A (2012)¹ conducted a randomized clinical trial (RCT) to assess the effect of listening to preferred music on pain intensity after open heart surgery. A total of 60 patients who were scheduled to undergo open heart surgery were randomly allocated in two groups. Patients in the intervention group (n= 30) listened to their preferred music by headphones for 30 minutes, whereas those in the control group (n= 30) did not listen to music. Using a Numerical Rating Scale (NRS), pain intensity was measured among the patients before the intervention, and immediately, 30 minutes and one hour after the intervention. Mean pain intensity in the intervention group before, immediately after, 30 minutes and one hour after the intervention were 5.8, 3.1, 2.5 and 2.4, respectively. Corresponding numbers in the control group were 4.7, 4.7, 4.8 and 4.9, respectively. Repeated measures ANOVA showed music to significantly reduce pain intensity (p = 0.0001). Based on the results researchers concluded that music can be effective as a non-pharmacological, inexpensive, non-invasive and side effect free method for pain management after open heart surgery.

Bauer BA, Cutshall SA, Anderson PG, Prinsen SK, Wentworth LJ (2011)⁴ conducted a randomized controlled trial to assess the effect of the combination of music and nature sounds on pain in cardiac surgical patients. In this, postoperative cardiovascular surgery patients were randomly assigned to a music group to receive 20 minutes of standard postoperative care and music twice daily on postoperative days 2nd, 3rd and 4th to a control group to receive 20 minutes

of standard care practices with a quiet resting period twice daily on postoperative days 2nd, 3rd and 4th. One hundred patients completed the study (music group, n = 49; control group, n = 51). The music was delivered through CD players in the patient's rooms. Data showed a significant decrease in mean (SD) pain scores after the second session of day 2 for the music group, compared with the control group. No major barriers to using the therapy were identified. Author concluded that recorded music and nature sounds can be integrated into the postoperative care of cardiovascular surgery patients. The recordings may provide an additional means for addressing common symptoms of pain while providing a means of relaxation for these patients.

Hatem TP, Lira PI, Mattos SS (2006)⁵ investigated, both objectively and subjectively, the effect of music on children in a pediatric cardiac intensive care unit following heart surgery, in conjunction with standard care practices. Randomized clinical trial with placebo, assessing 84 children, aged 1 day to 16 years, during the first 24 hours of the postoperative period, given a 30 minute music therapy session with classical music and observed at the start and end of the session, recording heart rate, blood pressure, mean blood pressure, respiratory rate, temperature and oxygen saturation, plus a facial pain score. Statistically significant differences were observed between the two groups after the intervention in the subjective facial pain scale and the objective parameters: heart rate and respiratory rate ($p < 0.001$, $p = 0.04$ and $p = 0.02$, respectively). A beneficial effect from music was observed with children during the postoperative period of heart surgery, by means of certain vital signs (heart rate and respiratory rate) and in reduced pain (facial pain scale).

A study was done by **Ozer N, Ozlu ZK, Arslan S, Gunes N (2008)**⁶ to assess the effect of music on postoperative pain and physiologic parameters of patients after open heart surgery. The aim of this study was to investigate the effect of listening to personal choice of music on self-report of pain intensity and the physiologic parameters in patients who have undergone open heart surgery. The study design was quasiexperimental. Patients were selected through convenience sampling in the Cardiovascular Surgery Intensive Care Unit at a university hospital. The study was conducted with a total of 87 patients who underwent open heart surgery: 44 in the music group, 43 in the control group, ages between 18 and 78 years. Through pretest-posttest design, postoperative first-day data were collected. First, physiologic parameters (blood pressure, heart rate, oxygen saturation, and respiratory rate) were recorded and a unidimensional verbal pain intensity scale applied to all participants. Later, the control group had a rest in their beds while the music group listened to their choice of music for 30 minutes. Physiologic data were then collected and the pain intensity scale applied once more. In the music group, there was a statistically significant increase in oxygen saturation ($p = .001$) and a lower pain score ($p = .001$) than in the control group. There was no difference between the groups in the other physiologic parameters. Results of this research provide evidence to support the use of music. Music might be a simple, safe, and effective method of reducing potentially harmful physiologic responses arising from pain in patients after open heart surgery.

3. Materials & Methods

This randomized control trial was conducted using time series Experimental Design in Cardiac units (Cardio thoracic ICUs and Cardio Thoracic wards), CNC, AIIMS, New Delhi. Ethical clearance for the study was obtained from institute Ethics Committee, AIIMS, consent was obtained and each participant was provided with PIS. Data was collected from June to November 2013. Total 54 patients were screened for the study among which 40 patients who met the eligibility criteria were randomly allocated to two groups, study group and control group using computer generated random numbers. Post-operative patients after valvular and CABG surgeries, extubated for at least 4-6 hours, Age ≥ 18 years and who were able to communicate in Hindi/English were enrolled. Patients unable to follow the commands were excluded.

Each patient was approached on individual basis on POD 1. Subject data sheet was filled by the researcher using interview technique and from the medical records. In Study Group, baseline pain intensity score and physiological parameter values were recorded. The study group patients were subjected to listen to music for half an hour in the morning (7-9am) and half an hour in the evening (5-7pm) using Transcend iPod and headset, along with standard care practices on POD₁ and POD₂. Patients were advised to close their eyes and relax while listening to music. After 30 min pain and physiological parameters were reassessed all 4 times. Feedback regarding music was obtained. In Control Group, baseline pain intensity score and physiological parameter values were recorded. The patients were provided standard care practices only (NSAIDS or opioids) for pain management. This was followed by reassessment of pain intensity and monitoring of physiological parameters in the morning and evening on POD1 and POD2.

Pain was operationally defined as an unpleasant sensory and emotional experience associated with cardiac surgeries and as measured by numerical pain rating scale (developed by Downie et al in 1978, a standardized and well established pain scale with $r = 0.78-0.93$).

A structured tool including the demographic data was prepared which included sections pertaining to Demographic and clinical data of the patients, Analgesics used, Pain assessment (0-10 numerical pain rating scale) record and physiological parameters (HR, RR and BP) record. Music selected was without lyrics, with a sustained melodic quality and a general absence of strong rhythms or percussion. After doing extensive review of literature and considering Indian choices, music by Pt. Shiv Kumar Sharma (Indian Santoor Player) was selected for the study. Initially four sets of music were chosen from amongst 20 music sets by listening and relistening by persons from different background and different age group. Try out of music was also done on 10 post cardiac surgery patients. Final set of music was selected as per the choice of majority of patients. The final music selected was the combination of four instrumental (Santoor) music tracks. Tracks were merged by the music recording experts. The final selected music includes Music contains natural soothing sounds of water, air and soft Santoor of total duration of 30 minutes.

4. Results

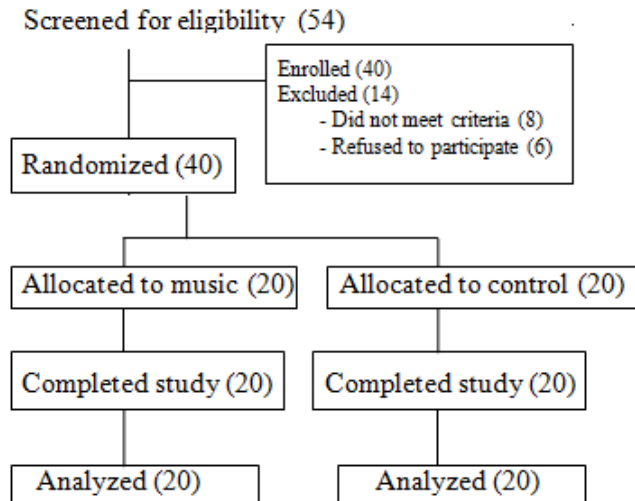


Figure 1: Flow diagram of the progress through the phase of the randomized trial

4.1 Demographic and clinical characteristics of study and control group

47.5% of the patients in both the groups were between 18-37 years of age. Majority (75%) of the patients were males, 60 % had undergone valvular heart surgery and 85% of the patients were not having music preference as a recreational activity. All of the patients were getting oral as well as injectable forms of analgesics for pain management. Thus patients in both the groups were homogenous in terms of age, gender, type of surgery and analgesics used.

4.2 Effect of music along with standard care practices vs. only standard care practices on pain intensity in post-operative cardiac patients (table-1).

There was no difference (0.275) in the morning baseline median pain score 5 (2-8) in study group and 3(0-9) in control group, on post- operative day 1. After 30 minutes also no significant difference (0.613) was seen in median

pain score 4 (0-7) in study group and 3 (0-9) in control group.

In the evening, baseline median pain score in study group was 5 (2-8) and in control group was 2 (0-8).After 30 minutes, median pain score was 3 (0-8) and 2 (0-8) in study and control group respectively. There was no difference (0.094, 0.869) between two groups in evening readings also.

On post- operative day 2, morning baseline median pain score of study group was 4 (0-8) and of control group 3 (0-7). After 30 minutes, median pain score was 3 (0-5) and 3 (0-9) in study group and control group respectively. There was no difference (0.218, 0.804) between two groups. Likewise there was no difference between two groups in evening readings (0.781, 0.868) as assessed by Mann - Whitney U test. Both the groups were similar in terms of post- operative pain intensity.

Comparison of pain intensity within the study group on post-operative day 1, showed a difference (0.001) in median pain score at baseline 5(2-8) and after 30 minutes 4(0-7) in the morning. Significant reduction in median pain score at baseline and after 30 minutes (0.001) was seen in evening reading also. Likewise on post- operative day 2, there was a difference between median pain score at baseline and after 30 minutes in both morning and evening readings (0.001, 0.003 respectively). Hence music has positive effect on pain within the group. In control group, no significant changes with regard to pain intensity were found within the group on first post- operative day morning and evening as well as second post- operative day morning (1.000, 0.083, 0.180) but decrease (0.014) was evident on second post- operative day evening as assessed by Wilkoxan's signed rank test.

4.3 Effect of music along with standard care practices vs. only standard care practices on physiological parameters in post- operative cardiac patients.

4.3.1 Effect on heart rate and respiratory rate

Generalized estimating equation (GEE)*p value < 0.05

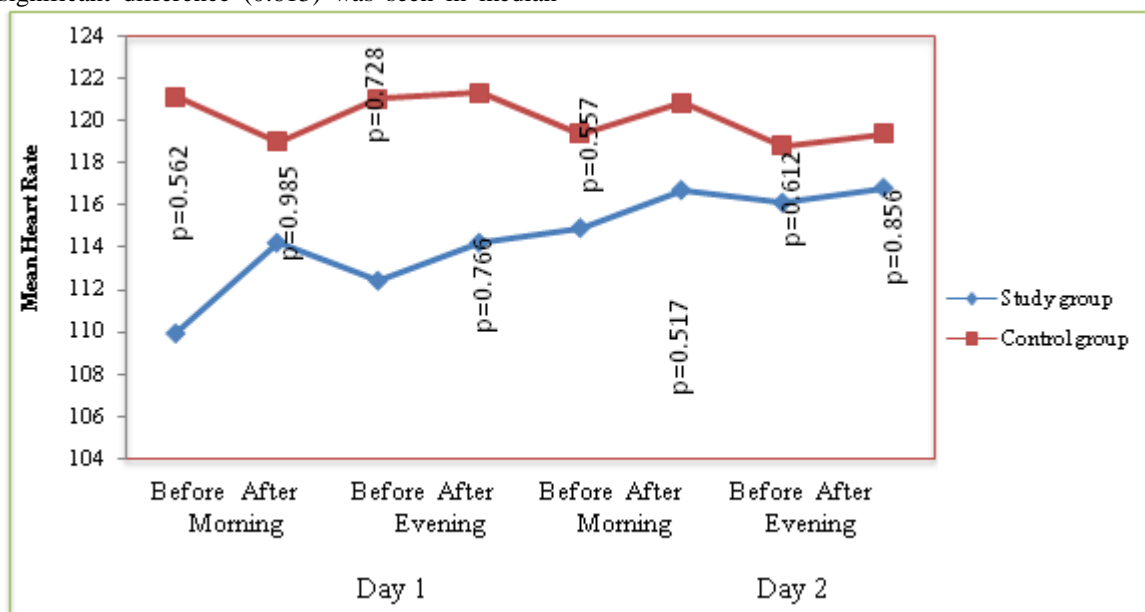


Figure 2: Line diagram showing comparison of study group and control group based on heart rate.

4.3.2 Effect on respiratory rate

Generalized estimating equation (GEE)*p value < 0.05

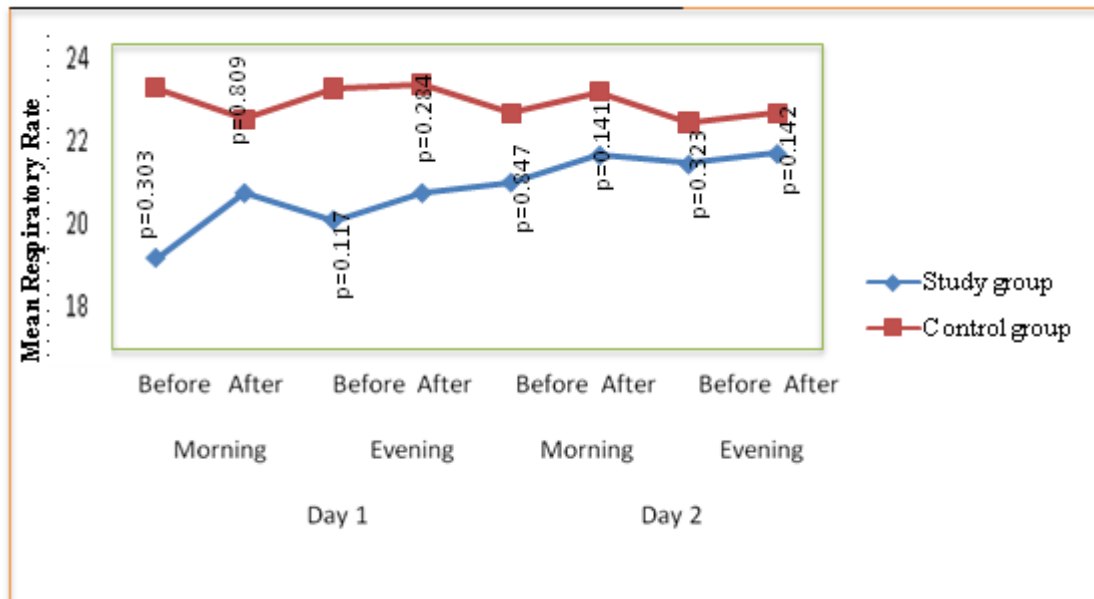


Figure 3: Line diagram showing comparison of study group and control group based on respiratory rate

There was no difference between the two groups (study and control group) in terms of heart rate and respiratory rate (fig 2 and 3) as assessed by Generalized estimating equation

(GEE). Heart rate and respiratory rate were within normal limits in both groups.

4.3.3 Effect on systolic blood pressure and diastolic blood pressure

Generalized estimating equation (GEE)*p value < 0.05

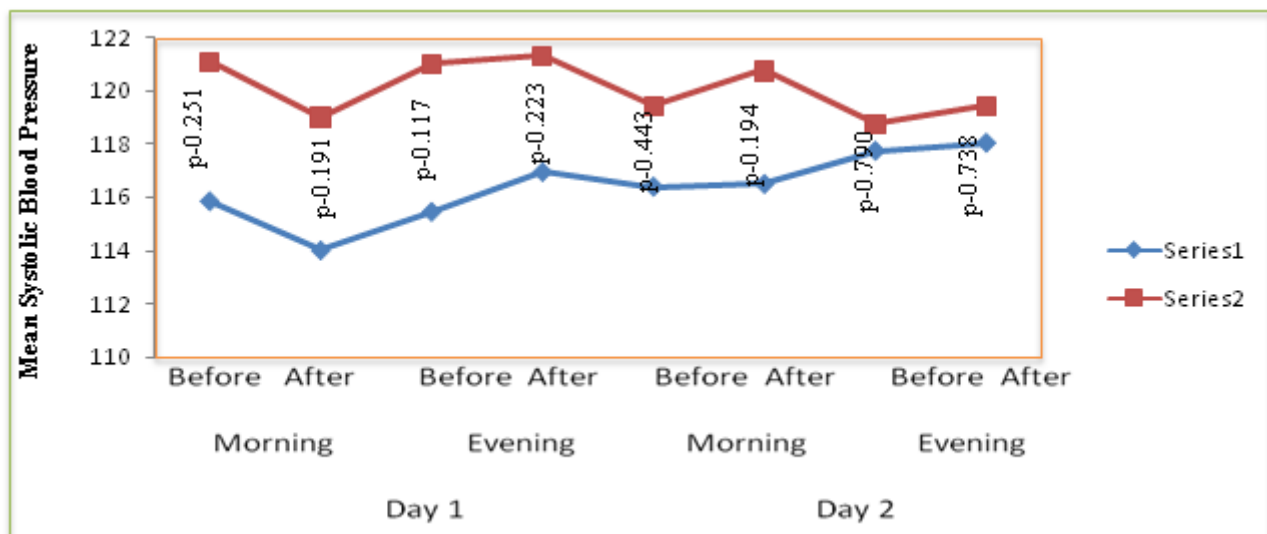


Figure 4: Line diagram showing comparison of study group and control group based on systolic blood pressure

4.3.4 Effect on diastolic blood pressure

Generalized estimating equation (GEE)*p value < 0.05

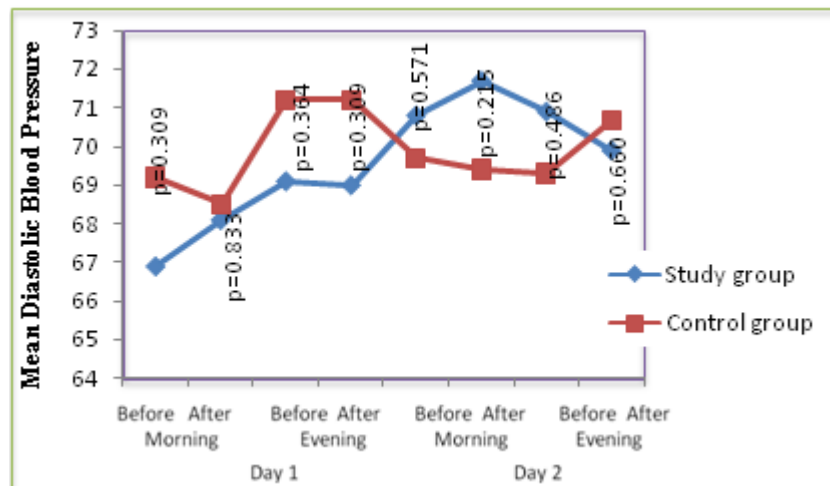


Figure 5: Line diagram showing comparison of study group and control group based on diastolic blood pressure.

There was no difference between the two groups (study and control group) in terms of systolic and diastolic blood pressure (fig 4 and 5) as assessed by Generalized estimating equation (GEE). Systolic and diastolic blood pressures were within normal limits in both groups.

After listening to music patients were requested to comment on music therapy to assess their acceptance. The views expressed by patients were:

“Felt good, pain reduced”, “Enjoyed a lot, it was relaxing, felt well (bahoot achha lga)”, “Enjoyed, I forgot about pain while listening to music. Pain decreases due to diversion”, “Felt nice, slept in between. This music is very relaxing but pain can further be decreased if music is of patient’s choice”, “Very nice, I loved it; everyone loves music, thank you”, “I like to listen to music, with music we forget about pain (Mujhe gaana sunana acha lagta hai, esse dard ke bare mai bhool jate hain)”, “Will prefer religious songs only”, “Music should be of my choice (sangeet hmari pasand ka hona chahiye)”, “Pain does not get reduced but I feel good for sometime (Dard mai toh kmi nhi hoti per hann thode samay ke liye achha lagta hai)”, “I don’t like this music there should be some lyrics too”, “It’s obvious to have pain after operation (Operation ke baad toh dard hota hi hai)”.

From the comments it is evident that majority of the patients liked music. They appreciated and enjoyed it. However many of them did not like to listen to music. This was highly subjective. It can be understood that there is less awareness regarding direct effect of CAM like music which might have hindered its acceptance.

5. Discussion

No significant difference was found in terms of post-operative pain intensity between study and control group on post-operative day 1, morning and evening as well as on post-operative day 2, morning and evening.

Similar findings have also been reported by Nilsson U (2009)⁷ who conducted a study to evaluate the effect of bed rest with music on the first postoperative day to decrease stress for patients who have undergone heart surgery and revealed that there was no difference in heart rate,

respiratory rate, mean arterial pressure, arterial oxygen tension, arterial oxygen saturation, and subjective pain and anxiety levels between the groups.

A study by McDaniel C et al (2008)⁸ on effects of music on perceived pain and anxiety in patients receiving PICCs and Port-A-Caths showed little effects of music on patients receiving PICCs.

Broschius SK (1999)⁹ reported that self-reported pain intensity and physiological responses after chest tube removal did not differ significantly among the groups with music therapy. Likewise Heiser RM et al (1997)¹⁰ examined the effect of music on pain and anxiety levels and selected physiologic parameters of two groups of patients who were emerging and recovering from anesthesia. No differences existed between the two patient groups in the variables measured.

Whereas Jafari H et al (2012)¹ reported significant reduction in pain intensity ($p = 0.0001$) with music therapy in intervention group as compared to control group. The plausible explanation for this could be that the study was conducted between 3 to 6 pm of the day when the traffic of hospital staff was lower and patient’s routine care was completed whereas in present study, readings were taken in morning (7-9 am) and evening hours (5-7 pm), the time when most of the procedures and investigations are carried out on patients and there are frequent rounds by health team members in this setting. This might not have allowed sufficient time for patients to concentrate and relax by on music and get diverted.

Results were also in contrary to the findings of Chan MF (2007)³ who presented significant reductions in pain score ($p < 0.001$) than in control group. Individual patient’s preferred music was used in the former study which could be the reason for contradictory findings.

The discrepancy in the results could also be because patients might not be accepting complementary and alternative medical therapies (CAM) like music during immediate post-operative period, as they are more anxious about the success of surgery as well as prognosis during this period.

- In the study group pain significantly reduced after music therapy on POD1 morning(0.001), POD1 evening (0.001) as well as on POD2 morning(0.001) and POD2 evening(0.003). Hence music has positive effect on pain within the group. Vossa JA et al (2004)¹¹ in a randomized control trial, proved sedative music was more effective than scheduled rest and treatment as usual in reducing pain in open-heart surgery patients during first time chair rest. These results are further supported by Sister Callista Roy's adaptation Model¹² according to which patients acquire adaptive behaviour (pain reduction) as soon as the adaptive processes are achieved. In the present study, pain decreases gradually from first post-operative day to second post-operative day.
- With regard to physiological parameters, no significant difference between two groups (study and control group) was found in any of the physiological parameters. All physiological parameters were within normal range in both groups. The results are congruent with the study done by Sendelbach SE et al (2006)¹³ in which no difference with music therapy was observed in systolic blood pressure (P=0.17), diastolic blood pressure (P=0.11), or heart rate (P=0.76) for patients undergoing cardiac surgery.

6. Additional Findings

After intervention subjects were asked to give their remarks on music therapy. From their comments it is evident that majority of the subjects liked music and commented that they felt good after listening to music. They appreciated the music and enjoyed it. However many of them did not like to listen to music. This was highly subjective. Subjective comments of patients show that there is less awareness regarding direct effect of CAM like music which might have hindered its acceptance.

7. Conclusion

Based on the scientific evidences it is concluded that CAM therapies should be thoughtfully used as not all CAM therapies work effectively during immediate post operative period when the patient is anxious about the prognosis.

8. Future Scope

- Similar study can be conducted using a large sample size and music listening for more duration.
- Study can be done at different point of time using 4-5 types of music sets as per individual preferences.
- Study can be done to assess the effect of music on other painful procedures like lumbar puncture, chest tube removal, pericardiocentesis, pleural tapping, intravenous or intra-arterial cannulation, surgical dressing, bone marrow aspiration etc.
- Study can also be replicated in multiple settings like labor room, paediatric ICU, oncology ward etc.

9. Study Limitations

- The study is a single setting study.

- Only patients after valvular surgeries and CABG were included.

10. Strengths of the Study

- Randomization was done.
- Presence of control group.
- Time series design was used in the study.

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Author Profile

Ms. Tarika is currently working as a Nursing Tutor in MMCON, M. M. University, India.

Mrs. Ashia Qureshi is working as a senior lecturer in CON, All India Institute of Medical Sciences, New Delhi, India.

Ms Shashi Mawar is working as a lecturer in CON, All India Institute of Medical Sciences, New Delhi, India.

Dr. V Devagourou is currently working as an Additional Professor, Department. of C.T.V.S, All India Institute of Medical Sciences, New Delhi, India

Table 1: Comparison of study group and control group based on pain intensity (n= 40)

	Morning (DAY 1)		Evening (DAY 1)		Morning (DAY 2)		Evening (DAY 2)	
	Baseline (0)	After 30 minutes (1)	Baseline (2)	After 30 minutes (3)	Baseline (4)	After 30 minutes (5)	Baseline (6)	After 30 minutes (7)
Study group (n₁=20)								
Pain Score								
Median (Min-Max)	5 (2-8)	4 (0-7)	5 (2-8)	3 (0-8)	4 (0-8)	3 (0-5)	2 (0-5)	1 (0-4)
Within[#] group p-value	.001*		.001*		.001*		.003*	
Control group (n₂=20)								
Pain Score								
Median (Min-Max)	3 (0-9)	3 (0-9)	2 (0-8)	2 (0-8)	3 (0-7)	3 (0-9)	2 (0-5)	1 (0-4)
Within[#] group p-value	1.000		.083		.180		.014*	
Between[@] groups p-value	.275	.613	.094	.869	.218	.804	.781	.868

[#]Wilcoxon signed rank test [@]Mann-Whitney U Test*p-value < 0.05