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Effect of Music on Postoperative Pain in Patients Under Open Heart Surgery

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Background: Music, as a non-pharmacological and inexpensive nursing intervention, can be used easily as a complementary technique in reducing pain along with other methods. While some studies have demonstrated pain to decrease after music, others found music to be ineffective on pain.

Objectives: The aim of this study was to investigate the effect of music on postoperative pain in patients under open heart surgery.

Patients and Methods: A quasi-experimental study was performed on 60 patients under open heart surgery referred to ICU of Shahid Beheshti hospital in Kashan city. Patients were randomly divided into two groups including experimental and control groups. Patients in music group listened to nonverbal music for 30 minutes after surgery by headphones. The control group did not receive any intervention other than routine care. Before and after intervention, pain intensity was measured and recorded by visual analog scale in two groups. Data was analyzed using Chi-Square and t-tests.

Results: Before intervention, the mean of pain intensity was 6.32 ± 0.21 and 6.10 ± 0.21 for experimental and control groups, respectively; and the difference was not significant ($P = 0.21$). After intervention, the mean of pain intensity was 3.11 ± 0.12 and 5.81 ± 0.38 for experimental and control groups, respectively; and the difference was significant ($P = 0.04$).

Conclusions: Listening to the relaxant music can reduce postoperative pain. It is suggested that relaxant music be used as a complementary method in patients in order to reduce prospective pain.

Keywords: Music; Pain; Open Heart Surgery

1. Background

Cardiovascular diseases have the highest death rates and will remain the primary cause of death in the world until 2020. Nearly 52% of deaths in the United States and 48% in Europe are related to these diseases (1). A large number of patients with coronary artery diseases, which do not respond to medical therapies have to undergo coronary artery bypass graft surgery (CABG) (2). The prevalence of CABG is 26.79% in North America, 0.72% in Asia, 17.94% in Western Europe and 18.14% in the rest of the world. In Iran, 60% of all open-heart surgeries are CABGs (3).

Pain is defined as an unpleasant sensory and emotional experience probably associated with actual or potential tissue damage. Although pain is a predictable part of the postoperative experience, inadequate pain management is common and have profound effects. Unrelieved postoperative pain may result in clinical and psychological changes that increase morbidity, mortality, and costs and decrease the quality of life (4). Moreover, ineffective postoperative pain management may result in complications such as deep vein thrombosis, pulmonary embolism, coronary ischemia, myocardial infarction, pneumonia, poor wound healing, insomnia, and demoralization (5). Moderate to severe postoperative pain is experienced by more than 80% of patients having surgery (2). Pain has also been reported as one of the primary sources of concern for cardiac surgery patients (2, 5, 6). Pain can be caused by incisions, intraoperative tissue retraction and dissection, multiple intravascular cannulations, chest tubes left after surgery, and multiple invasive procedures that patients undergo as part of their therapeutic processes (7). In one study, patients reported chest incision pain as a problem after CABG (8). Because of pain, patients cannot take deep breaths, cough, or start moving around as soon as they should, which consequently may result in delayed recovery (9). Associated with these complications are economic and medical implications, such as extended lengths of hospital stay and patient dissatisfaction with medical care (10). It is proposed that effective management of postoperative pain after CABG can be an important factor in overall recovery. Music is an inexpensive, non-pharmacological, noninvasive nursing intervention that has no side effects and can be effective along with other methods (2, 6). Although music effect mechanism in reducing the pain is not clear completely, increasing of Mio receptors on the cells surface and increasing of endor-

phins are suspected as the probable mechanisms in this context (11). In examining the effects of music on patients have undergone CABG, a number of studies have demonstrated decreases in postoperative pain (12, 13), whereas Nilsson *et al.* found no difference in pain (14).

There are limited numbers of published studies on the effect of music in pain reduction after open-heart surgery (12). In addition, music has a cultural implication (15) and insufficient studies have been conducted in countries such as Iran. Meanwhile, the success of music therapy may be greatly enhanced by determining patient's preference, familiarity and cultural context (16). While some studies have demonstrated pain to decrease after music (6, 9, 17-20), others found music to be ineffective on pain (20, 21). Many previous investigations have been limited in a way. For instance, some employed a small sample size (22), some evaluated different types of surgeries and anesthesia in one study (23), or used a type of music not selected by patients (24, 25). Moreover, while a systematic review recommended a minimum duration of 30 minutes for music therapy to be effective in clinical practice (14), a number of studies played music for less than 30 minutes (12, 26). On the other hand, the constant presence of the researcher during the intervention (25) might have affected patient's response. Considering the above mentioned facts and according to the cultural, social and economic differences in Iran, we conducted the present study.

2. Objectives

The aim of this study was to investigate the effect of music on postoperative pain in patients underwent open heart surgery.

3. Patients and Methods

A quasi-experimental study was performed on 60 patients underwent open heart surgery referred to ICU of Shahid Beheshti hospital in Kashan city during 2012 and 2013. Inclusion criteria were age between 18 to 60 years, complete consciousness, reading and writing ability, moderate or severe pain based on Visual Analog Scale (VAS), not having addiction to sedatives and alcohol, hemodynamic stability, first time open heart surgery, not having mental disorders, not having chronic pain, not having hearing disorders and being in the first postoperative day after CABG or valve replacement. Patients were excluded if they were connected to a ventilator at the time of intervention, used other alternative methods for pain reduction such as massage therapy during the intervention (except routine pain medication in the ICU).

In the present study, data were collected from the patients undergoing CABG or valve replacement surgery. For those patients undergoing valve replacement surgery, the incision region was in the sternum. However, in patients undergoing CABG surgery, the incision regions were sternum and leg, where the saphenous vein was removed. Thus, two different pain regions were determined by taking the region of incisional pain into consideration (1 = chest incisional pain region; 2 = chest and leg incisional pain regions).

3.1. Sampling

The sample size in each group was determined based on the following assumptions: power = 0.80, $\alpha = 0.05$, the minimum expected difference in standard deviation = 3.6, and the minimum expected difference in means to be 2.40 (27). According to the formula, the sample size in each group was 30. In total, 82 patients were assessed for eligibility. Among those, 13 did not have the inclusion criteria, and 9 ones declined to participate. Therefore, 60 patients were randomly assigned into two groups including experimental and control groups (Figure 1). The data collection instrument consisted of two parts; first part was the demographic characteristics including age, gender, marital status, surgery type, education level, and the second part included a VAS. In which, score zero shows no pain and score 10 shows the most level of experienced pain. This scale has extensively been used in the studies related to pain and its validity and reliability have been confirmed (28, 29).

3.2. Procedures

The data were collected between 3.00 p.m. and 4.00 p.m. when the traffic in ICU was not intense and the patients were not receiving invasive or noninvasive procedures. All of the patients received standard care under supervision of a cardiovascular specialist. All the patients received 50 mg Pethidine and beta-receptor blocker (metoprolol succinate) at 8 a.m. by the ICU nurse. The patients also received 3-5 mL/min oxygen delivered through nasal cannula. The second researcher helped the participants lie down in a relaxing position. In addition, factors affecting pain intensity, such as incision method, type and extent of incision, having chest tube, and type of analgesic drugs used, were the same for all patients. Demographic and pain intensity scale (VAS) were completed in the first 24 hours after the surgery in the ICU.

The patients in the music group listened to sedative music by an MP3 player with special headphones for 30 minutes. Sedative music was operationalized as music without lyrics and with a sustained melodic quality, with a rate of 60-80 beats per minute and a general absence of strong rhythms or percussion. Changing the volume was in the control of the patient. Sedative music was selected by a music expert considering the cultural factors. During the intervention, for all participants, the environment was enhanced to reduce

stimuli and facilitate rest by closing the door and posting a sign to prevent being disturbed by visitors and health care personnel.

During this period, the second researcher-stayed in ICU. Pain intensity was re-evaluated immediately after the music was completely played in two groups. However, in the control group, headphones were used without playing any music.

3.3. Ethical Considerations

The study was approved by the research deputy and the research ethics committee of Kashan University of Medical Sciences. All participants signed a written informed consent before participation in the study. The respondents were anonymous and all the information was kept confidential in this study. The participants were free to leave the study at any time. The ICU nurses were informed about the results at the end of the study. The researchers observed all ethical issues in accordance with the Helsinki declaration.

3.4. Data Analysis

The data was analyzed using SPSS software Version 13 (SPSS, Chicago, IL, USA). The normality the data was assessed using Kolmogorov-Smirnov test. Mann-Whitney-U test was applied where the distribution of the data was not normal. Mean score and standard deviation were calculated. Chi-square and t- tests were used to compare nominal variables between the two groups. T-test was also used to compare the statistical difference between the mean differences of pain in the two groups. A P value < 0.05 was considered to be statistically significant in all testes.

4. Results

A total number of 60 patients undergoing open heart surgery were enrolled in this study. A proportion of 43.3% of patients were in the age range of 50- 65 years old. Also, 56.6% of the patients were male and all married. No significant difference was observed between the mean of pain intensity in the experimental and control groups before intervention (P = 0.21). However, a significant difference was found between the mean of pain intensity in the experimental and control group at 30 minutes after music therapy (P = 0.04). Also, a significant difference was observed between the mean of pain intensity in the experimental groups before and after intervention (p = 0.01) (Tables 1 and 2).

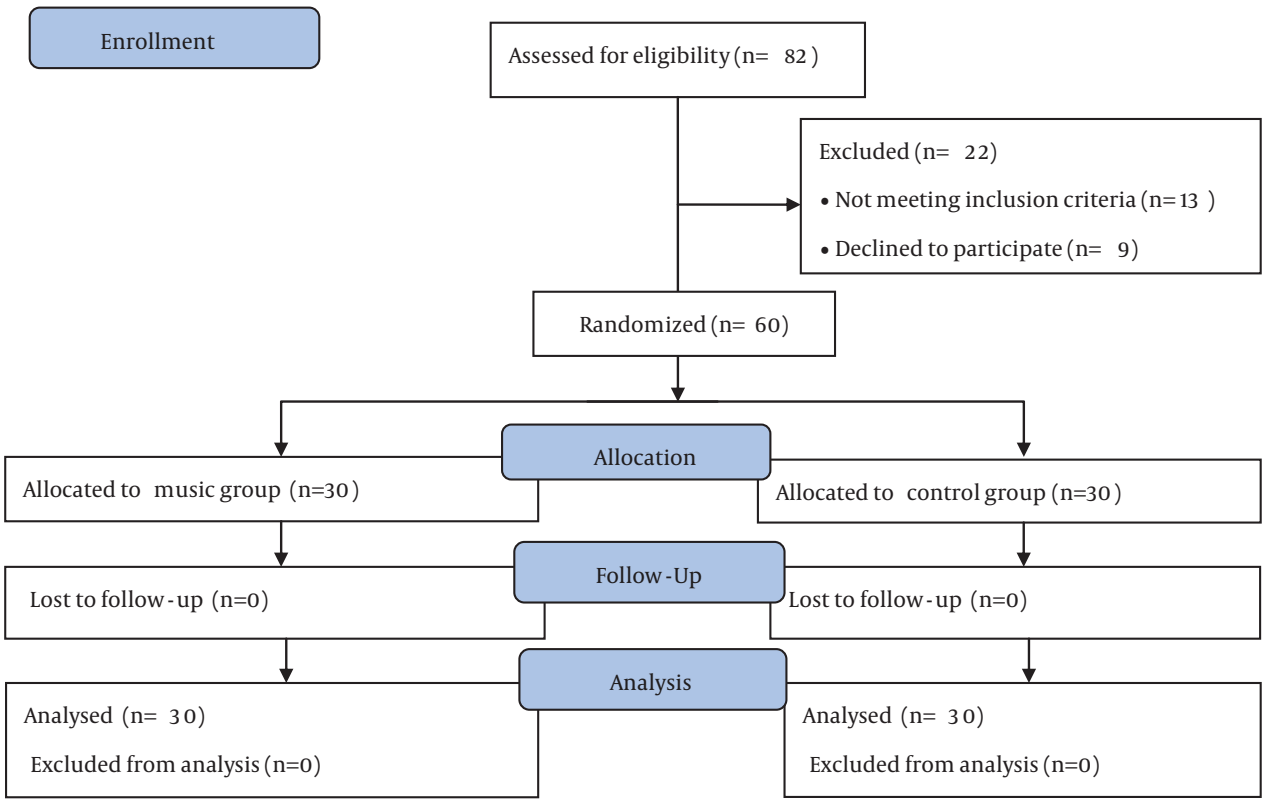

Figure 1. The Sampling Framework of the Study

Table 1. Pain Intensity in the Experimental Groups [a]

Variable	Experimental Group	Control Group	Chi-Square and p-Value
Gender			Chi-square = 3.51, P = 0.11
Female	18 (60)	13 (43.3)	
Male	12 (40)	17 (56.6)	
Marital status			Chi-square = 2.86, P = 0.09
Married	25 (83.3)	23 (76.6)	
Single	5 (16.6)	7 (23.3)	
Age Group, y			Chi-square = 3.11, P = 0.28
20-35	6 (20)	8 (26.6)	
35-50	11 (36.6)	8 (26.6)	
50-65	13 (43.3)	14 (46.6)	
Education level			Chi-square = 3.9, P = 0.14
Secondary education	11 (36.6)	9 (30)	
Diploma	9 (30)	14 (46.6)	
Academic	10 (33.3)	7 (23.3)	
Type of Surgery			Chi-square = 2.91, P = 0.15
Valve replacement	10 (33.3)	8 (26.6)	
CABG	20 (66.6)	22 (73.3)	

[a] Data are presented as No. (%).

Table 2. Comparing The Mean of Pain Intensity in Two Groups Before and After Intervention

Groups	Before intervention	After Intervention	Independent t-Test
Experimental Group	6.32 ± 0.21	3.11 ± 0.12	T= 4.3/P = 0.01
Control Group	6.10 ± 0.21	5.81 ± 0.38	T= 2.25/P = 0.21
Paired t-Test	T = 2.87/P = 0.21	T = 3.49/P = 0.04	-

5. Discussion

Most of the using methods for reducing postoperative complications such as pain are based on drugs intervention. Our effort in this study was to assess the effect of music as a non-pharmacological and inexpensive intervention in reducing postoperative pain. Based on the results of this study, music significantly decreased postoperative pain after open heart surgery. Consistent with the present study, Sendelbach *et al.* (12) and Hatem *et al.* (30) showed that music reduced patients' pain after cardiac surgery. The finding that listening to music was effective in relieving postoperative pain is consistent with other studies that examined the effects of music on pain after cardiac surgery (18, 31). Voss *et al.* investigated the effect of music on pain during chair rest after open heart surgery and reported that the pain level of the sedative music group was lower than in the scheduled rest or treatment as usual groups (13). This finding is inconsistent with present study. The inconsistencies between studies may be attributed to differences in type of music, music time, type of disease, patients' culture and music playback time. Aragon *et al.* investigated the effect of harp music in vascular and thoracic surgical patients by using VAS to measure patients' pain. The VAS was completed just before harp playing 20 minutes after harp playing was started, and 10 minutes after completion. Results indicated that listening to live harp music had a positive effect on patient perception of pain (17). This finding is consistent with findings of the present study. However, Aragon *et al.* study used harp music, and the present study used sedative music. It seems that every type of music is effective in reducing pain. Zimmerman *et al.* demonstrated that music intervention decreased postoperative pain in CABG patients (21). Similarly, Nilsson *et al.* reported that patients exposed to soft relaxing music intra-operatively, had significantly lower pain scores compared with the control group patients on the first day after the surgery (32). In contrast, Allred *et al.* evaluated patients undergoing knee arthroplasty and did not find any significant pain reduction in the music group as compared with the control group (2). Results of Allred *et al.* are inconsistent with present study perhaps because they used music for 20 minutes; whereas, we used music for 30 minutes after surgery in ICU.

The current study is consistent with the findings from previous studies that sedative music was more effective than scheduled rest or usual treatment in reducing pain in ICU. Studies that have not found significant effects on pain (33) or have found mixed results had small sample sizes with inadequate power to detect significant differences. The lack of significant findings in some studies may be related to the suddenness of pain experienced during chest tube removal or upon awakening from surgery (33), when patients may have had difficulty focusing on the music intervention. Experts have suggested that sedative music is more effective if the patient is able to concentrate on the intervention (33).

Moreover, music ineffectiveness in some studies could be attributed to the type of the music listened by the patients, ie, one type of Spanish guitar music was played for all participants without considering the local and national culture of the patients. However, it has been suggested that preferred music, as opposed to prescribed music, is a critical factor in the effectiveness of music therapy (19). The results of Woldendorp *et al.* showed a significant correlation between the degree of relaxation and liking the music (34). Since the emotional responses toward music may be different in various cultures, a type of music related to the cultural features of the subjects should be selected (3).

The effects of sedative music may be attributable to having something more pleasant to concentrate on or something to distract their minds from the pain and help them relax their bodies (19, 35-36).

This study had several limitations. The study was conducted in only one ICU, and the study sample reflects only one area of Iran. Furthermore, data were collected by one researcher. The available selection of music included only nonverbal musical pieces, which limited participants' choices. Our study only evaluated pain severity, and we did not include vital signs evaluation. Future studies are recommended to include larger samples from different regions of Iran and should also include a larger selection of music pieces.

The findings of the study indicated the positive effect of music on reducing the postoperative pain. Thus, music can be used as a complementary and noninvasive method in relieving postoperative pain. Music, as a nursing intervention, is a noninvasive and safe therapy for health promotion of patients. However, the music listened by patients should be of a sedative quality, and culturally appropriate selections should be offered. Nurses can use music as an intervention for patients who have undergone open heart surgery to promote nursing autonomy and the idea that nurses are able to affect patients' environment.

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Authors' Contributions

Neda Mirbagher Ajorpaz designed the research and performed data analysis and prepared the first draft of the manuscript and supervised the study. Abouzar Mohammadi contributed in preparing. Hamed Najjaran and Shahla Khazaee collected the data.

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