RESEARCH ARTICLE

EFFECT OF MUSIC MEDICINE ON ANXIETY AND DEPRESSION IN CORONARY ARTERY BY PASS GRAFT SURGERY PATIENTS: A RANDOMISED CONTROLLED TRIAL

Asma Sharma[1], Dr. Vaishali Kishan[2], Dr. A. G. Jayakrishnan[3], Niraj Kumar[4] and V. Prem[5]

1. Assistant Professor, B.K.L Walawalkar Medical College, Sawarde Chiplun Maharashtra. India.
2. Professor/ HOD, Department of Physiotherapy, MCOHAS Manipal. India.
3. Chief Consultant Cardiothoracic Surgeon, Nawaloka Hospital, Colombo, Sri Lanka.
4. Associate Professor, Shri Guru Ram Rai Institute of Medical & Health Sciences, Patel Nagar Dehradun, Uttrakhand. India.
5. Professor/ HOD, Department of Physiotherapy Manipal Hospitals Bangalore. India.

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Manuscript Info

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Abstract

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Background: The study was done to see the effect of music medicine on anxiety and depression in coronary artery by pass graft surgery patients. Two groups Experimental and Control were taken. The study concludes that music medicine is an effective non pharmacological measure in reducing anxiety and depression along with physiological measures in patients undergoing coronary artery bypass graft surgery.

Objectives: To compare the effects of music medicine between experimental & control group on anxiety & depression. To find the effect of music medicine on Heart rate (HR), Blood pressure (BP), Respiratory rate (RR).

Material and Methods: Subjects enrolled in the study were assigned to 2 groups, 35 in each group (Experimental group receiving music medicine with standard care in form of chest physiotherapy & Control group with standard care alone, using block randomization. The total duration of intervention for the study per patient was 1 month.

Results: A total of 69 subjects were recruited for this study. Subjects in both the groups had a mean age of 57.72 ± 9.26 years. Chi square (x^2) test was used to evaluate demographic data like, sex, marital status, occupation, education, comorbidities like diabetes, hypertension, smoking,alcohol, NYHA Grade of exertion, life style, & Student unpaired 't' test for age, number of diseased vessel & ejection fraction. Both the groups were matched and there was no significant difference between the groups.

Conclusion: The study concludes that music medicine is an effective non pharmacological measure in reducing anxiety and depression along with physiological measures in patients undergoing coronary artery bypass graft surgery.

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Corresponding Author: - Asma Sharma
Address: - Assistant professor, B.K.L. Walawalkar medical college, Sawarde Chiplun Maharashtra India

Introduction:-

Coronary Artery Disease (CAD) is a major cause of illness & death world wide. It results due to accumulation of atheromatous plaques within the walls of the coronary arteries that supply the myocardium (the muscle of the heart) with oxygen and nutrients.[1]

According to the World Health Organization (WHO), 16.7 million people worldwide die of cardiovascular diseases (CVD) each year. By 2020, the WHO estimates 25million CVD deaths globally (WHO 2003).[2]

The prevalence of CAD in India has increased from 1% in 1960 to 9.7% in 1995 in urban population and almost doubled in the last decade and by year 2015, CAD could be the most important cause of mortality in India.[3]

CABG is a treatment of choice and is widely used interventional method for the relief of coronary-artery disease symptoms which effectively relieves angina and increases life expectancy.[4]

The prevalence of depression in patients with diagnosed CHD is quoted between 20-45%. Elevated anxiety scores have been reported for 20 to 55%. The same prevalence ratios have been found for patients undergoing CABG surgery.[5 & 6]

Music has been used in different medical fields to decrease anxiety and depression.[8,9,10,11] Music is a combination of rhythmical, harmonic and melodic sounds, and many peoples, throughout history, have believed in its medicinal effects. It's a systematic intervention process in which a therapist helps patients to improve health, utilizing musical experiences and the relationships that develop through them, such as dynamic forces of change.[7 & 12]

The pilot study was done on post CABG patients and according to this study, listening to music shortened the average amount of time patients spent in ICU postoperatively by more than 5 hours.[13]

Aim of the Study:

The aim of the study is to find the effect of music medicine on anxiety and depression in Coronary artery bypass graft patients.

Review of Literature:

Gallagher R, McKinley S. (2007) study was done on stressors & anxiety in patient undergoing CABG .172 patients were interviewed to determine their concern and anxiety levels before surgery, before discharge & 10 days after discharge and they found that anxiety levels did not change from before to after surgery and hence they concluded that patients waiting for CABG should be routinely assessed for anxiety before the procedure and interventions to prevent or reduce anxiety should be provided.[4]

Szekely A, Balog DP and Benko E, (2007) et al study was done on to find the long term effect of anxiety & depression on outcomes after cardiac surgery. Total no. of 180 patients who underwent cardiac surgery studied and followed up for 4 years. [14]

Bradt J, Dileo C (2009). A Cochrane review on stress and anxiety reduction in coronary heart disease patient was done and it states that no evidence for anxiety reducing effect of music was found for the patients undergoing cardiac procedures also no evidence of effect of music for depression was found.[2]

Methodology:-

It was a randomized controlled trial. Convenience samples were assigned to 2 group's i.e. Experimental group & control group. These subjects were solicited from the OPD physiotherapy department Kasturba Medical College Hospitals, Mangalore and selected according to inclusion and exclusion criteria. Inclusion criteria Subjects diagnosed to have coronary artery disease and admitted for elective CABG. Subjects were recruited after being shifted to the ward. Exclusion Criteria- Aversion to music, Deafness, Cerebrovascular diseases, Heart valve repair surgery patients, Presence of neuromuscular disorder, History of head trauma, seizures, Patients on anti anxiety & anti depressant drugs, Hemodynamically unstable patients, Presence of neuropsychiatric disorder, Emergency CABG and Cognitive impairment.

Sample size:-
70 (power of 95%)

$$n = 2 \times \frac{[Z_\alpha + Z_{(1-\beta)}]^2}{\delta^2} \sigma^2$$

Where $z_\alpha = 1.96$, $Z_{(1-\beta)} = 1.282$, $\sigma^2 = $ Standard deviation, $\delta^2 = $ Mean deviation

$$= 2 \times \frac{(1.96+1.282)^2 \times (2.5)^2}{(2.1)^2}$$

n = 30 in each group,
10% drop is acceptable, keeping this fact we took n = 35 as sample in each group.

Procedure:
An approval from the time bound Ethical Committee was obtained before commencing the study. Subjects were screened for inclusion and exclusion criteria. All subjects meeting the selection criteria were given a detailed explanation about the purpose, method and benefits of the study and a written informed consent was obtained (Appendix 1 and 2). A briefing was given to the family members about the purpose and the method of the study.

Subjects enrolled in the study were assigned to 2 groups, 35 in each group (Experimental group receiving music medicine with standard care in form of chest physiotherapy & Control group with standard care alone, using block randomization. The total duration of intervention for the study was 1 month.
1. Supervised - 1 week duration (hospital stay)
2. Unsupervised – 4 weeks duration (home programme)

Demographic data and baseline assessment of subjects was done prior to starting the intervention. (Appendix 5)
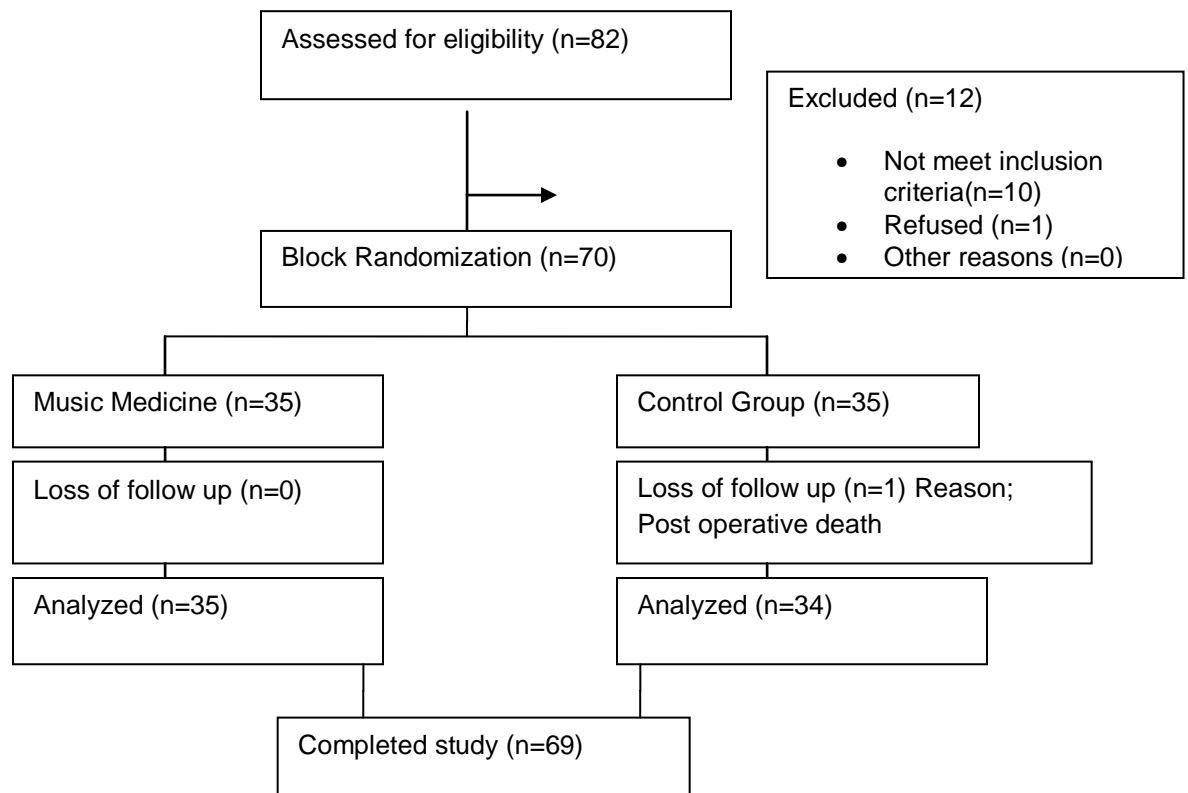
Flow Diagram for Randomization of Patients in the study

Subjects were given the following instructions prior to starting the intervention:
1. Subject's should'nt eat a heavy meal/ingest caffeine/alcohol 2hrs prior to session.
2. Subject's should'nt participate in vigorous exercise or activity 1hr prior to session.
3. To inform the experimenter of any other use of prescription or non-prescription drugs.
4. Patient can discontinue listening music at any time if he/she is not feeling comfortable.

Experimental Group
Patients were asked to fill a questionnaire related to their music preferences. (Appendix 4) Accordingly, they were provided with a collection of non- lyric Indian classical instrumental music from which they had to select one record of their choice. The factors of rhythm, tempo & pitch of the music used were taken care of. The collection was of 60- 80 beats per minute, known to have relaxing effect. Patients were explained and were asked to fill self report Hospital Anxiety and Depression scale questionnaire (Appendix 3). Patients were made to lay down comfortably in supine position and baseline values of BP, RR, HR, test values at rest were measured by an independent observer (on duty nurse) who was blinded to the study.

Music was provided by means of an audio mp3 player with headphones with a collection of different types of non lyrical music (instrumental) having tempo of 60-80 beats per minute, from which patient chose the desired music. Once the player was switched on, subjects were asked to clear their thoughts and focus their mind on the music with eyes closed for minimum of 30 minutes. Patients also received routine standard chest physiotherapy following CABG including, vibration, deep breathing exercises, incentive spirometry, active limb movements, positioning and ambulation. Patient continued listening to music and if he/she wished, after 30 minutes music player was switched off.

Treatment:
Twice daily – each music session consisting of 30 minutes.
1. Supervised-1week duration (hospital stay)
2. Unsupervised – 1 month duration (post-discharge)

A diary was provided to record in it if subjects have listened 30 minutes of music twice a day. Every week patients were reminded of and checked by telephone if they were continuing listening to music.

Control group:
Base line assessment of pulse rate, respiratory rate, blood pressure was done. Subjects included in this group received standard care alone as in the experimental group.

Pre and post intervention measures of anxiety, depression were taken on the 1st day of the admission & after 1 month of follow up and HR,BP,RR were measured on the day of admission, and the day of discharge. Following discharge, subjects were given same cassette/CD so as to continue to listen music at home.   .

After 1 month, subjects were asked to come for a follow-up and the HADS questionnaire for anxiety, depression was explained again and asked to fill by the patients.

Results:-
Among the 82 patients undergoing open heart surgery, 70 fulfilled inclusion criteria. One of the patients in the control group died post surgery. Consequently 35 participants in music group and 34 participants in control group were included in the analysis (figure 1). A total of 69 subjects were recruited for this study. Subjects in both the groups had a mean age of 57.72 ± 9.26 years.

Chi square (x^2) test was used to evaluate demographic data like, sex, marital status, occupation, education, co morbidities like diabetes, hypertension, smoking, alcohol, NYHA Grade of exertion, life style, & Student unpaired 't' test for age, number of diseased vessel & ejection fraction.

Both the groups were matched and there was no significant difference between the groups and both the groups were comparable with respect to sex (p=0.090), marital status (p= 0.321) , employment(p= 0.061), New York Heart Association (NYHA) grade (p= 0.141), smoking (p= 0.704), alcoholic (p= 0.733), diabetes (p=0.52), hypertension (HTN p= 0.845), life style (p=0.142), education (p=0.553), age (p=0.865), number of diseased vessel (p=0.478), ejection fraction (EF% p=0.629) (Table1) and medications during hospital stay were given uniformally to all patients undergoing surgery in both the groups according to the surgeon and anesthetist team of the hospital. Medications at discharge are as given below (table 2)

Table1:- Demographic & Baseline Data.

Parameters		Music group	Control group
Age		57.91 ± 9.5	57.53 ± 9.2
Male		91.4 %	76.5%
Female		8.6%	23.5%
Single		2.9%	0%
Married		97.1%	100%
Education	<12 yrs	31.4%	38.2%
	≥ 12 yrs	68.6%	61.8%
Alcoholic		31.4%	35.3%
Smoking		45.7%	41.2%
Diabetes		57.1%	64.7%
Hypertension		71.4%	73.5%
Employed		17.1%	11.8%
Retired		77.1%	61.8%
Other(Home Maker)		5.7%	26.5%
NYHA	grade I	8.6%	0%
	grade II	80%	94.1%
	grade III	11.4%	5.9%
Lifestyle	Active	40%	23.5%
	Sedentary	60%	76.5%
Number of diseased vessels	1	11.4%	2.9%
	2	17.1%	23.5%
	3	71.4%	73.5%
EF%		57.69 ± 8.24	58.62 ± 7.67

Table 2:- Medications at the time of discharge.

Type	Music	Control
Anti HTN	80%	73.5%
ON	65.7%	79.4%
OHA	57%	47%
Statins	82.8%	88.2%
IV Heparin	25%	11.7%
β- blockers	2.8%	5.8%

The change within group in all 5 dependent variable: Heart rate, Respiratory rate, Systolic blood pressure, Diastolic blood pressure, Anxiety and Depression were compared (Table 3) & (Table 4)

Table 3:- HR, RR, SBP, DBP during treatment.

Parameters	Groups	Preop (Mean ± SD)	At Discharge (Mean ± SD)
HR (beats/min)	Music	79 ± 7.09	78.83 ± 5.62
	Control	80.38 ± 5.59	84.50 ± 5.86
RR (breaths/min)	Music	22.29 ± 3.19	18.69 ± 1.82
	Control	21.65 ± 2.15	23.38 ± 2.62
SBP (mmHg)	Music	136.00 ± 10.90	118.89 ± 7.45
	Control	136.71 ± 9.10	128.29 ± 5.82
DBP (mmHg)	Music	87.60 ± 8.20	77.31 ± 6.26
	Control	88.24 ± 9.03	79.68 ± 7.81

Table 4:- HADS Anxiety & Depression during treatment.

Parameters	Groups	Baseline (mean ± sd)	1 month (mean ± sd)
Anxiety	Music	10.43 ± 2.83	3.60 ± 1.75
	Control	10.24 ± 3.38	10.00 ± 2.86
Depression	Music	9.06 ± 2.96	5.23 ± 1.85
	Control	9.59 ± 3.84	10.35 ± 2.91

Mean change in anxiety, depression and physiological parameters HR, RR, SBP, DBP between the groups is given in (table 5)

Table 5:- Mean change between groups.

Parameters	Duration	Mean difference (standard error)
Anxiety	Pre to follow up	6.59 (0.717)
Depression	Pre to follow up	4.59 (0.79)
SBP	Pre to discharge	8.7 (2.80)
DBP	Pre to discharge	1.72 (2.25)
HR	Pre to discharge	4.28 (1.96)
RR	Pre to discharge	5.33 (0.88)

Heart Rate:
Heart rate was analyzed with two factor ANOVA for repeated measures. Within groups difference prior to discharge was significant [F= 4.03, p=.04] and difference between groups was also significant [F=4.77, p=0.03] (Table 6).

Table 6:- Two way ANOVA for repeated measures.

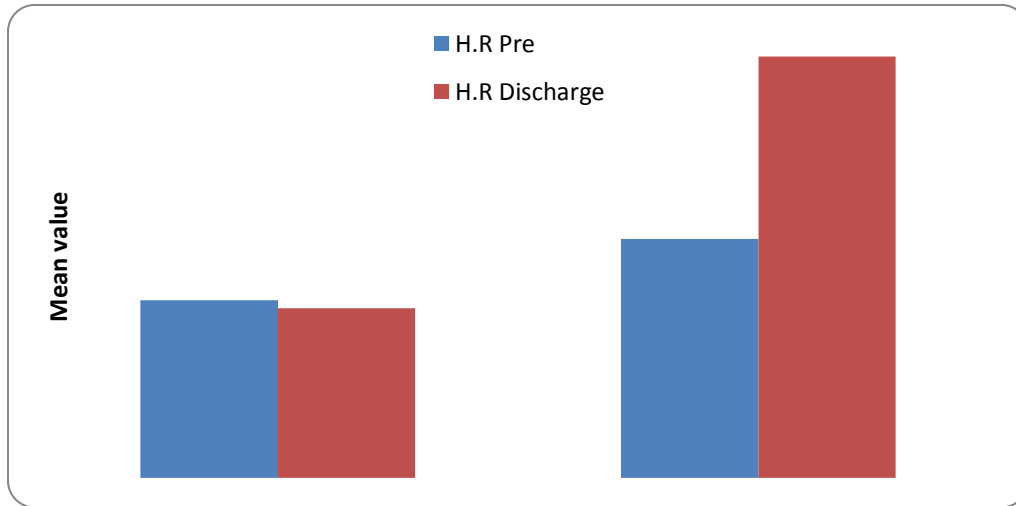| HR	F value	pValue
Difference Pre to discharge	4.03	0.49*
Difference between groups	4.77	0.03*

*Highly significant (P≤ 0.05)

Bonferroni test was done to do comparision within group from pre to discharge.Results in music group were not significant (p=0.17) but, in control group change was significant in terms of increase in heart rate from pre to discharge. (Table 7)

Table 7:- HR pre to discharge.

Group	Mean difference (Standard error)	pValue
Music group	0.17 (1.35)	0.90*
Control group	- 4.11 (1.42)	0.00*

*Highly significant (P≤ 0.05).

Figure 1:- Graph showing mean value of HR pre- discharge music & control.

Respiratory Rate :
Respiratory rate was analyzed with two factor ANOVA for repeated measures. Within groups difference pre to discharge was significant [F= 4.46, p=.038] and difference between groups was highly significant [F=36.58, p=0.00] (Table 8)

Table 8:- Two way ANOVA for repeated measures.

RR	F value	P Value
Difference pre to discharge	4.46	0.03*
Difference between groups	36.58	0.00*

*Highly significant (P≤ 0.05)
Bonferroni test was done to do comparision within group from pre to discharge. In music group results showed highly significant from pre to discharge (p=0.00) and in control group pre to discharge it was significant (p=0.00). (Table 9)

Table 9:- RR pre to discharge.

Group	Mean difference (Standard error)	pValue
Music	3.60 (0.66)	0.00*
Control	-1.73 (0.58)	0.00*

*Highly significant (P≤ 0.05)

Figure 2:- Graph showing mean value of RR pre- discharge music & control.

Blood Pressure :
Systolic BP
SBP was analyzed with two factor ANOVA for repeated measures. Results showed within groups difference pre to discharge highly significant [F= 82.92, p=0.00] also difference between groups was highly significant [F=9.63, p=0.00] (Table 10).

Table 10:- Two way ANOVA for repeated measures.

SBP	F value	P Value
Difference pre to discharge	82.92	0.00*
Difference between groups	9.63	0.00*

*Highly significant (P$\leq$ 0.05)
Bonferroni test was done to compare Systolic BP within groups from pre to discharge. Results in music group were highly significant from pre to discharge (p=0.00) also results in control group pre to discharge were highly significant (p=0.00) (Table 11)

Table 11:- SBP pre to discharge.

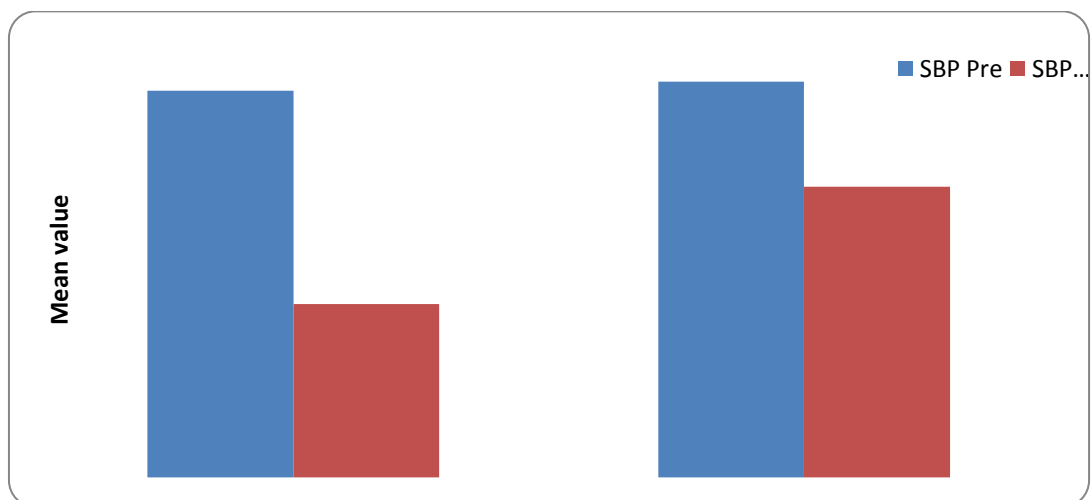| Group	Mean difference (Standard error)	pValue
Music group	17.11 (2.14)	0.00*
Control group	8.41 (1.79)	0.00*

*Highly significant (P$\leq$ 0.05)

Figure 3:- Graph showing mean value of SBP pre- discharge music & control.

Diastolic BP:
DBP was analyzed with two factor ANOVA for repeated measures. Results showed within groups difference pre to discharge highly significant [F= 70.07, p=0.00], but difference between groups was not significant [F=0.58, p=0.44] (Table 12)

Table 12:- Two way ANOVA for repeated measures.

DBP	F value	P Value
Difference pre to discharge	70.07	0.00*
Difference between groups	0.58	0.44*

*Highly significant (P≤ 0.05)

Bonferroni test for within group comparision of Diastolic BP within groups from pre discharge. Results in music group were highly significant from pre to discharge (p=0.00) also in control group pre to discharge was highly significant (p=0.00) (Table 13)

Table 13:- DBP pre to discharge.

Group	Mean difference (Standard error)	pValue
Music group	10.28 (1.56)	0.00*
Control group	8.55 (1.62)	0.00*

*Highly significant (P≤ 0.05)
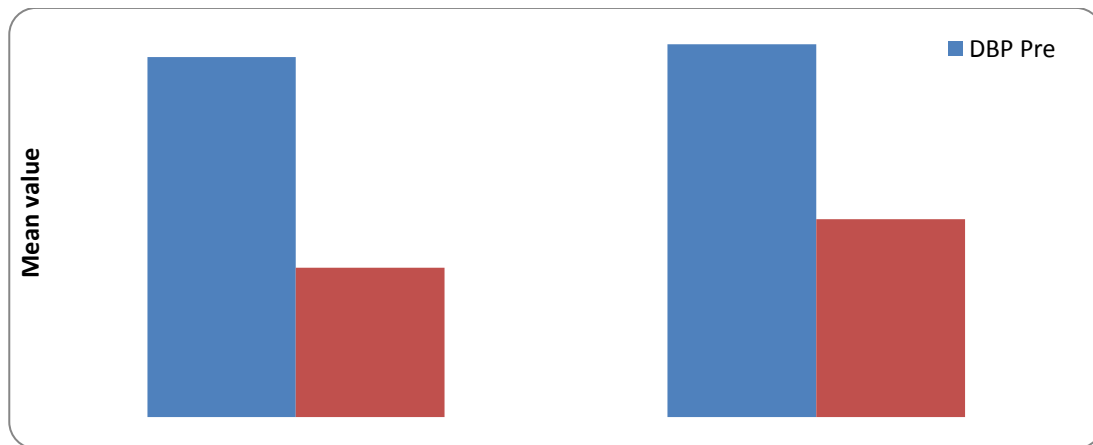
Figure 4 :- Graph showing mean value of DBP pre- discharge music and control

Anxiety :
Two way ANOVA for repeated measures was applied to analyze anxiety pre and after one month follow up which showed highly significant results ; difference between pre and after 1 month follow up [F = 96.88, p= 0.00] as well as difference between groups [F=84.41 ;p=0.00] (Table14).

Table 14:- Two way ANOVA for repeated measures.

Anxiety	F value	P Value
Difference between pre and 1 month follow up	96.88	0.00 *
Difference between groups	84.41	0.00*

*Highly significant (P≤ 0.05)

Bonferroni test was used to see change in anxiety from pre to 1 month which showed highly significant change in music group (mean diff =6.82) (p=0.00) as compared to control group (mean diff= 0 .23) (p=0.62). (Table 15)

Table 15:- Anxiety pre to 1 month.

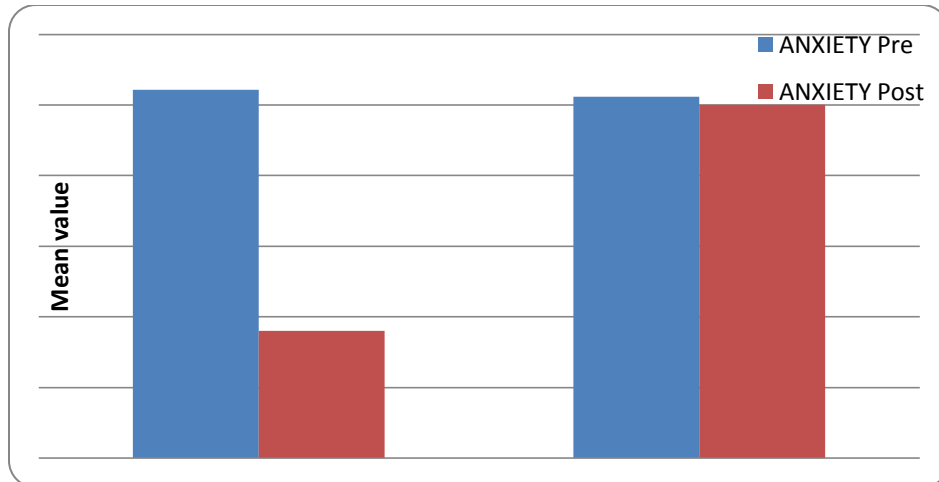| Group	Mean difference (Standard error)	pValue
Music group	6.82 (0.53)	0.00*
Control group	0.23 (0.62)	0.62*

*Highly significant (P≤ 0.05)

Figure 5:- Graph showing mean value of Anxiety pre- 1month Music and control.

Depression:
Two way ANOVA for repeated measures was applied to analyze depression pre and after 1 month follow up which showed highly significant results. Difference between pre and after 1month follow up [F=14.91, p= 0.00] as well as difference between groups [F=33.53, p= 0.00] (Table 16).

Table 16:- Two way ANOVA for repeated measures.

Depression	F value	P Value
Difference between pre and one month follow up	14.91	0.00*
Difference between groups	33.53	0.00*

*Highly significant (P≤ 0.05)
Bonferroni test was used to see change in Depression from pre to 1 month which showed highly significant change in music group (mean diff = 3.82) (p=0.00) as compared to control group (mean diff= - 0.76) (p=.24). (Table 17)

Table 17:- Depression pre to 1 month

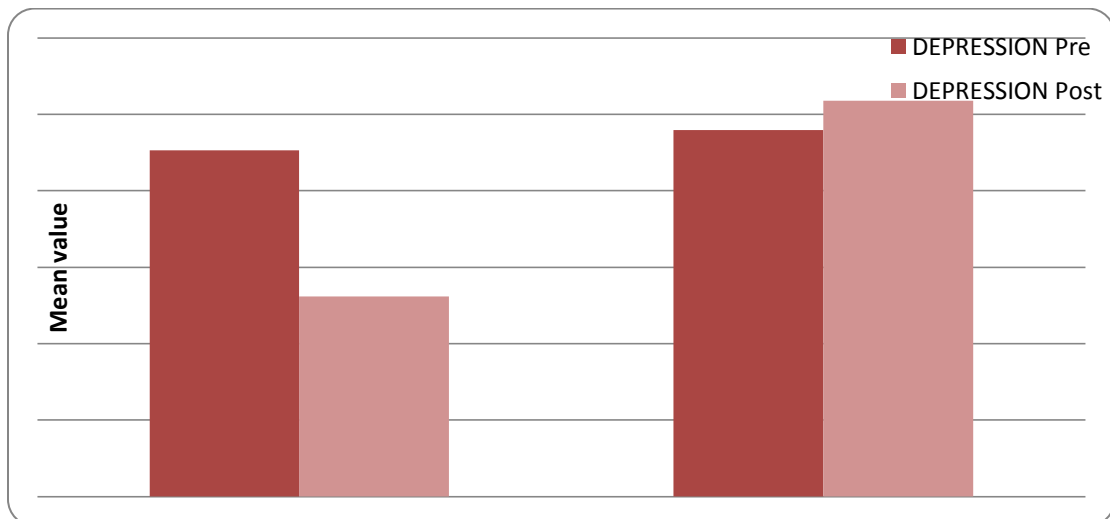| Group	Mean difference (Standard error)	pValue
Music group	3.82 (0.47)	0.00*
Control group	- 0.76 (0.64)	0.24*

*Highly significant (P≤ 0.05).

Figure 6:- Graph showing mean Value of Depression pre to 1 month.

Discussion:-

Our study aimed to find the effect of music medicine on anxiety, depression and the physiological variables HR,RR,BP in CABG patient. The study showed that anxiety and depression level reduced significantly in CABG patients who listened to music postoperatively and during one month of follow up as compared to control group. Physiologic measures (SBP,HR,RR,) also showed significant mean change between groups,but no significant change was seen in DBP.

Effect of Music on Anxiety & Depression

Our study showed a significant reduction in anxiety and depression levels post music intervention compared to control group. The current study used non lyrical music which was administered for 30 minutes twice daily till hospital stay by means of headphones and continued for 1 month following discharge.

In our study there were no differences at baseline for anxiety and depression between groups. Following music intervention there was a mean change of 6.8 in anxiety for HADS in music group where as this change was only 0.2 in control group. Results of our study were considered significant in accordance with mean differences of 2.1 in the earlier study.[15]

Effect of Music on Physiological Variables HR, RR, BP
In the current study, SBP change by 17.11 in music group and 8.4 in control group. At discharge the mean change in SBP between groups was 8.7. There was reduction in SBP in both the groups. This was similar to the earlier studies.[17, 18] which was further clinically significant according to Benson that minimum change for relaxation response is when reduction in SBP is by 5mmHg.[16]

Limitations:

1. Presence of nurse in the room during the music session as interruption to music intervention, also duration of music listened by patients might vary as minimum duration of music session was of 30 minutes twice daily, during hospital stay and 1 month follow up, but maximum duration of music listened by the individual subject was not calculated which might have effect on the outcome variables.
2. Reliability of patients listening music at home can also be questioned.

Conclusion:-

The study concludes that music medicine is an effective non pharmacological measure in reducing anxiety and depression along with physiological measures in patients undergoing coronary artery bypass graft surgery.

Acknowledgement:-

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