Jonita Wilma Rodrigues
MSc. Nursing, Medical Surgical
Nursing, Laxmi Memorial
College of Nursing, A.J
Towers, Balmatta, Mangalore,
Karnataka, India

Dr. Larissa Martha Sams
Principal and HOD,
Department of Medical
Surgical Nursing, Laxmi
Memorial College of Nursing,
Mangalore, Karnataka. India

Effectiveness of foot and hand massage on postoperative pain, anxiety and selected physiological parameters among postoperative open heart surgery patients in cardiothoracic intensive care units of selected hospitals of Mangaluru

Jonita Wilma Rodrigues and Dr. Larissa Martha Sams

Abstract
Background: Cardiac surgeries, such as coronary artery bypass grafting and valve replacement rank among the most frequently performed surgical interventions worldwide and necessitate the routine admission of patients to the ICU. Physical and psychological symptoms such as postoperative pain and anxiety will be persisting in patients who undergo major event such as open heart surgery. Massage is a therapy in which there is manual manipulation of muscles and soft tissues of the body through the application of various systematic and rhythmic hand movements which influences a person physiologically, psychologically during the treatment of illness.
Methodology: An experimental research approach was adopted for the study. Purposive sampling technique was used to select the study subjects. Data was collected by using Demographic and Clinical Proforma, Numeric Pain Scale, Faces Anxiety Scale, Six item Short Form of State Trait Anxiety Inventory and Physiological Parameter Checklist. Pre-test was conducted before half an hour of intervention (massage) in the morning and evening on day 1, day 2 and day 3. Intervention was given for a period of 20 minutes after the pre-test. Post-tests were conducted at 30 mins and 60 mins after the intervention in the morning and evening on day1, day2 and day 3.
Results: There was a significant difference between the pre-test and post-test scores of pain (F=2.92, p<0.05) between the experimental and control group. There was a significant difference in the post-test scores of pain (post-test1, t=2.81, post-test 2- t=4.03), p<0.05 in day 1 evening (post-test 2, t=3.84, p<0.05), day 2 morning (post-test 2, t=5.14, p<0.05), day 3 morning, (post-test 1, t=5.202, p<0.001), (post-test2, t=2.18, p<0.05) and day 3 evening (post-test1, t=5.68, post-test 2, t=6.25, p<0.001). Significant difference was found in the pre-test and post-test anxiety score (F = 2.92, p<0.05) in the experimental group compared to control group. There was significant difference in the post-test 2 scores of anxiety on day 2 (Morning: t=3.270, Evening: t=2.825, p<0.001), day 3 morning (post-test 1, t=2.466, p<0.05), (post-test 2, t=4.172, p<0.001) and day 3 evening (post-test 2, t=4.987, p<0.001).Also significant difference in post-test anxiety scores on day 1 (morning: post-test 2, t=2.990, evening: post-test 2, t=2.781, p<0.001), Day 2 morning (post-test 2, t=2.950, p<0.001) using six item short form of state anxiety inventory. There was a significant difference in the post-test 2 scores of respiratory rate on day 2 morning (t=3.120, p<0.001), evening (t=3.237, p<0.001) and in the post-test2 scores on day 3 (morning: t=3.159, p<0.001, evening: t=2.598, p<0.05). Significant difference was found in the post-test 1 scores of heart rate on day 1 (morning: t=2.818, p<0.05, evening :t=2.65, p<0.05) There was no association of pre-test scores of pain, anxiety and selected physiological parameters with demographic variables.
Conclusion: The findings of the study demonstrated that foot and hand massage was effective non-pharmacological methods to reduce pain and anxiety in postoperative open heart surgery patients. Providing complementary therapies like foot and hand massage to open heart surgery patients will significantly reduce pain and anxiety level.

Keywords: Foot and hand massage; effectiveness; pain; anxiety; physiological parameters; open heart surgery

Introduction
The fact for humans and other animals is that life is associated with a healthy beating heart. Heart is the central organ of the body which consist of several functions for the entire body.

Correspondence
Jonita Wilma Rodrigues
MSc. Nursing, Medical Surgical
Nursing, Laxmi Memorial
College of Nursing, A.J
Towers, Balmatta, Mangalore,
Karnataka, India

As it is a vital organ, it is more susceptible to malfunction causing severe complications to human life [1]. As today's world is full of problems, sickness and diseases, health is the most important thing which should be kept in mind [2]. Cardiovascular disease refers to any disease that affects the cardiovascular system mainly cardiac disease, vascular diseases of the brain and kidney, and peripheral arterial disease [4]. In order to manage this dreadful disease, many latest diagnostic and therapeutic measure have been developed keeping in pace with modern technology. One such important surgical technique is the open heart surgery [5]. Open heart surgery is the most common cardiac surgery which has been indicated for the patients with heart valve disease, birth defects of the heart and coronary artery disease [34]. According to the National Heart, Lung and blood institute (NHLBI), Coronary artery bypass grafting (CABG) is the most common type of heart surgery done in adults [36]. The American heart association in the year 2002 estimated that that 6, 86,000 open heart surgeries are conducted every year in the United States [37]. According to the census of 2015, 2,00,000 open heart surgeries were performed in India. An Indian transplant registry has estimated that at least 10 heart transplants are performed every year [38].

Surgery is a life event of dramatic significance which disrupts an individual's personal, physiological and economic lives as well their physical bodies [6]. The postoperative period of cardiac surgery patients is associated with complications such as increased length of hospital stay, pain, anxiety, depression and decreased sleep. Pain has been one of the main points of concern for cardiac surgery patients [7, 8]. Anxiety is another important factor to be considered especially when a serious invasive procedure is performed, wherein an organ such as heart is involved and thereby the immediate goal is to reduce anxiety [10].

Many alternative therapies such as aromatherapy, biofeedback, breathing exercises, distraction, guided imagery, massage and music have been used successfully to complement care and can be proposed to minimize the stress and pain of cardiac surgery patients [13]. Complementary therapy or alternative therapy is one where nurses can communicate care to the patient and touch is a central role of healing [14]. Massage involves working and acting on the body with pressure structured, unstructured, stationary or moving tension, motion or vibration done manually or with mechanical aids [15]. It is easy to say that the relaxation induced through massage can be helpful for reducing pain and anxiety [16].

Materials and Method
An experimental research approach was adopted to assess the effectiveness of foot and hand massage on postoperative pain, anxiety and selected physiological parameters in postoperative open heart surgery patients in cardiothoracic intensive care units of selected hospitals of Mangaluru. Quasi experimental pre-test post-test control group design was adopted for the study. This study was conducted in Intensive care units of 3 multispecialty hospitals namely A.J Hospital and Research Centre, Indiana Institute of Heart sciences and Omega hospital, Mangaluru., 40 samples that have undergone open heart surgery and are in cardiothoracic intensive care unit were recruited to the study (20 in the experimental and 20 in the control group) Purposive sampling technique was used to select the samples. An

official permission for conducting the study was taken from the director and administrative departments. Subjects were assigned to experimental and control group through purposive sampling. Pre-test level of pain, anxiety and selected physiological parameters was measured for both the experimental and control group before the half an hour of intervention on postoperative day 1, 2 and day 3. Massage was given to patients after two hours of administration of analgesics (tab Dolo) at 10 am and 5 pm in the morning and evening. At first, each hand was massaged for 5 minutes and then each foot was massaged for 5 minutes. Post-test was conducted on 30th minute and 60th minute after the intervention in the experimental and without intervention for control group.

Description of the tools
The tool for data collection had three sections: Section A, B, C, D and E.

Section A: Demographic and Clinical Profoma
This is for the assessment of demographic and clinical variables prepared by the researcher which consisted of 7 items regarding age, sex, marital status, educational status, nature of work, history of previous surgery and type of open heart surgery.

Section B: Numerical Rating scale to measure pain: It is a standardised tool comprising of 0- no pain, 1-3 mild, 4-6 moderate, 7-9 severe pain, and 10 worst possible pain.

Section C: Six item Shortform of STAI to assess anxiety (STAI: Y-6) The tool was developed by Theresa M. Marteau and Hilary Bekker [123]. It is self evaluation questionnaire consisting of 6 items. The positive items were scored as 1=4, 2=3, 3=2, 4=1 (calm, relaxed, content). The positive items were 1, 3, 6.

Section D: Faces Anxiety Scale to assess anxiety (FAS)
This tool was developed by Sharon. McKinley, Professor of Critical Care Nursing, University of Technology, Sydney [124]. The FAS is a single item scale with 5 possible responses, ranging from a neutral face to face showing extreme fear, and is scored from 1 to 5.Permission was obtained from the author to use the tool.

Section E: Observational checklist for physiological parameters This was prepared by the investigator herself to observe the physiological parameters. It includes pulse, respiration, systolic and diastolic BP. The findings are graded, observed and recorded correspondingly.

Validity and Reliability of the tool
Content validity was used for demographic proforma and observational checklist for physiological parameters. Consent for the tool validation was obtained by sending a requisition letter and an acceptance form. Experts were requested to give their opinions and suggestions regarding each item in the terms of Strongly (SA), Agree and Disagree. The items of the tools were modified according to the recommendations and suggestions from nine experts. The reliability of the tool was established by administering the tool to 10 patients who were admitted in cardiothoracic intensive care unit and have undergone open heart surgery in selected hospitals of Mangaluru. The Numerical Pain

Scale is a standardised tool, and the reliability of the English version was done by the author. Test re-test reliability was used to establish equivalence by using Spearman Rank Correlation (r=0.96) in English-speaking popuation.[120] The 6 item STAI has demonstrated content validity and inter-rater reliability. Kendal tau correlation was used for inter-rater reliability. The reliability value for six item STAI is (r=0.87), inter-rater reliability was used to establish faces anxiety scale by using Kendal tau correlation (r=0.87). Physiological parameter checklist was prepared by the Researcher herself. Inter-rater reliability method was used to establish the equivalence of physiological parameter checklist by using Kendal tau correlation of each item (heart rate {r=0.875}, respiration {r=0.848} and systolic blood pressure {r=0.505} and diastolic blood pressure r={0.803}.

Result
Section A: Distribution of sample according to their demographic variables
Majority of sample (50%) in the experimental group as well as (50%) in the control group were in the age group of 51-60 years. Majority of sample (50%) in the experimental group

as well as (50%) in the control group were in the age group of 51-60 years. Highest percentage of the subjects in the experimental group (65%) and in the control group (75%) was married. Highest percentage of subjects in the experimental group (25%) and control group (40%) were having secondary education. Majority of the subjects (80%) had no history of previous surgery in the experimental and (85%) in the control group. Majority of the sample in the experimental group (65%) and control group (75%) were moderate workers Majority of subjects in the experimental group (75%) as well as in the control group (80%) had undergone open heart surgery such as coronary artery bypass grafting.

Section II: Description of level of pain, anxiety and physiological parameters in postoperative patients before and after the foot and hand massage in experimental and control group
1. **Description of level of pain in postoperative patient:** Level of pain of the open heart surgery patients was assessed using numerical pain scale at postoperative day 1, day 2, and day 3 in the morning and evening.
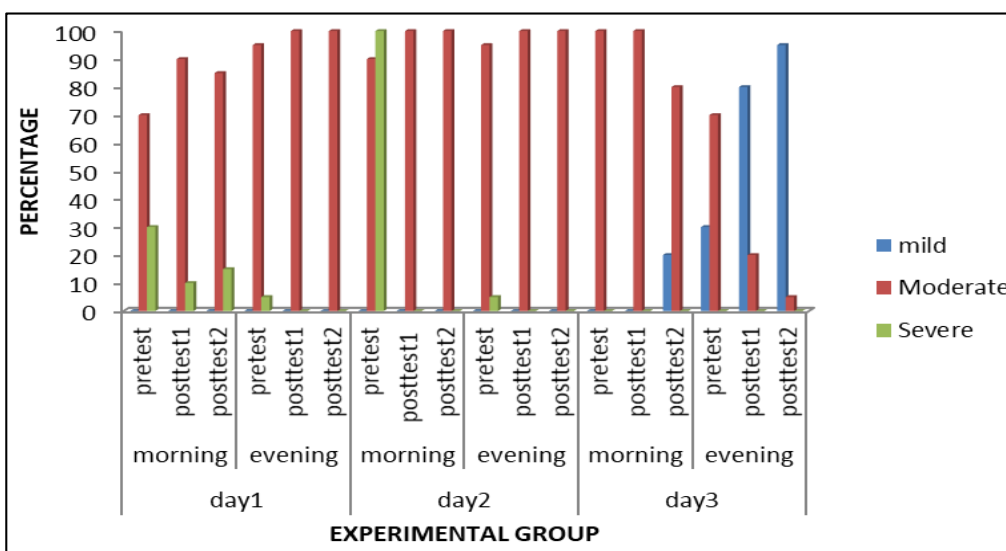

Fig 1: Bar diagram representing the percentage distribution of sample based on the pain level of the experimental group on Day 1, Day 2 and Day 3
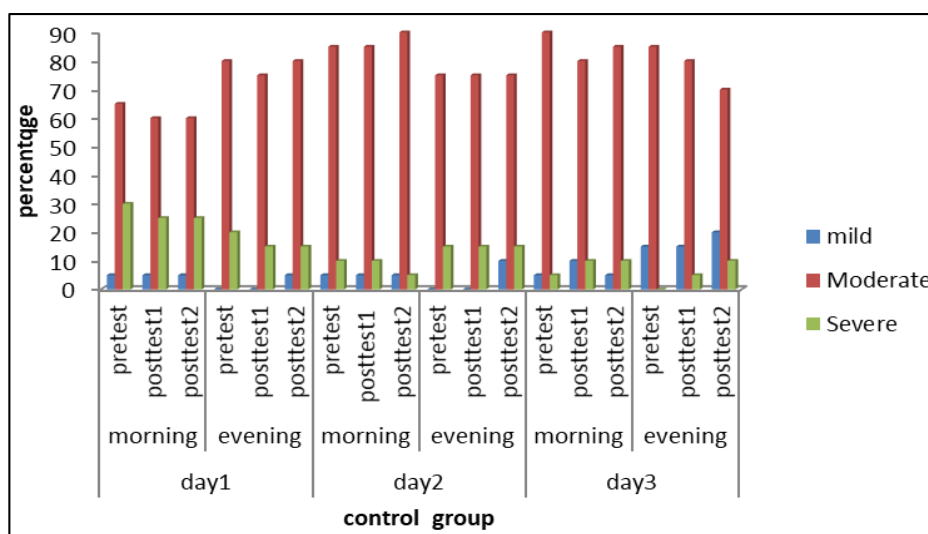

Fig 2: Bar Diagram Representing the Percentage distribution of Sample based on the Pain level of the control group on Day1, Day 2 and Day 3.

2. Description of level of anxiety in postoperative open heart surgery patients

Level of anxiety of open heart surgery patients was assessed using faces anxiety scale at postoperative day 1, day 2 and day 3 in the morning and evening

Table 2: Distribution of samples based on anxiety score in the experimental and control group (FAS) N=20+20

Group	Time	Scores	Day 1			Day 2			Day 3		
			Pre-test	Post1	Post2	Pre-test	Post 1	Post 2	Pre-test	Post1	Post2
			f %	f %	f %	f %	f %	f %	f %	f %	f %
E	Morning	1	-	-	4 20	1 5	3 15	10 50	2 10	6 30	15 75
		2	5 25	11 55	11 55	13 65	14 60	9 45	13 65	14 70	5 25
		3	15 75	9 45	5 25	6 30	3 15	1 5	5 25	-	-
		4	-	-	-	-	-	-	-	-	-
		5	-	-		-	-	-	-	-	-
	Evening	1	-	-	7 35	1 5	6 30	12 60	3 15	9 45	19 95
		2	6 30	14 70	10 50	14 70	11 55	7 35	15 75	11 55	1 5
		3	14 70	6 30	3 15	5 25	3 15	1 5	1 5	-	-
		4	-	-	-	-	-	-	-	-	-
		5	-	-	-	-	-	-	-	-	-
C	Morning	1	-	-	1 5	-	-	1 5	1 5	2 10	4 20
		2	6 30	8 40	10 55	9 45	14 70	16 80	10 50	14 70	13 65
		3	13 65	11 55	8 40	11 55	6 30	3 15	9 45	4 20	3 15
		4	1 5	1 5	1 5	-	-	-	-	-	-
		5	-	-		-	-	-	-	-	-
	Evening	1	-	1 5	4 20	1 5	2 10	3 15	3 15	6 30	7 35
		2	8 40	10 50	8 40	11 55	13 65	13 65	13 65	10 50	13 65
		3	12 60	9 40	8 40	8 40	5 25	4 20	4 20	4 20	-
		4	-	-	-	-	-	-	-	-	-
		5	-	-	-	-	-	-	-	-	-

Level of anxiety was assessed using Speilberger's State trait inventory (STAI:Y-6) on day 1, day 2 and day 3 in the morning and evening.

Table 3: Distribution of the Subjects based on anxiety scores in the experimental and control group (STAI:Y-6) N=20+20

Group	Time	Range of scores	Day 1			Day 2			Day 3		
			Pre-test	Post1	Post2	Pre-test	Post 1	Post 2	Pre-test	Post1	Post2
			f %	f %	f %	f %	f %	f %	f %	f %	f %
E	Morning	Mild	-	-	-	-	-	-	-	-	-
		Moderate	14 70	12 60	17 85	13 65	13 65	18 90	14 70	12 60	13 65
		Severe	6 30	8 40	3 15	7 35	7 35	2 10	6 30	8 40	7 35
		Extreme	-	-	-	-	-	-	-	-	-
	Evening	Mild	-	-	-	-	-	-	-	-	-
		Moderate	13 65	12 60	13 65	14 70	16 80	16 80	14 70	18 90	13 65
		Severe	7 35	8 40	7 35	6 30	4 20	4 20	6 30	2 10	7 35
		Extreme	-	-	-	-	-	-	-	-	-
C	Morning	Mild	-	-	-	-	-	-	-	-	-
		Moderate	13 65	13 65	10 50	12 60	11 55	11 55	13 65	10 50	11 55
		Severe	7 35	7 35	10 50	8 40	9 45	9 45	7 35	10 50	9 45
		Extreme	-	-	-	-	-	-	-	-	-
	Evening	Mild	-	-	-	-	-	-	-	-	-
		Moderate	13 65	8 40	6 30	11 55	10 50	9 45	11 45	13 65	13 65
		Severe	7 35	12 60	14 70	9 45	10 50	11 55	9 45	7 35	7 35
		Extreme	-	-	-	-	-	-	-	-	-

Section C: Effectiveness of foot and hand massage on postoperative pain, anxiety and physiological parameters of open heart surgery patients

Effectiveness of foot and hand massage on pain

To find the significance difference in the mean pain scores of the experimental and control group, following null hypotheses is formulated. $H0_1$: There will be no significant difference between mean pre-test and post-test scores of pain in postoperative open heart surgery patients receiving hand and foot massage in the experimental group and control group.

Table 4a: Difference in the Pain scores in the experimental and control group on day 1 and day 2 (Numerical pain scale) N=20+20

			Range	Mean±SD	F value	p value
Day 1 E		Morning Pre-test	5-8	6.15±0.933	3.416	0.040*
		Post-test 1	4-7	5.70±0.865		
		Post-test 2	4-7	5.40±0.940		

		Range	Mean±SD	F value	p value
	Evening Pre-test Post-test 1 Post-test 2	4-7 3-6 3-6	5.25±0.786 4.75±0.786 4.20±0.834	8.568	0.001**
C	Morning Pre-test Post-test 1 Post-test 2	3-8 3-8 3-8	6.05±1.146 5.95±1.050 5.80±1.281	0.234	0.792
	Evening Pre-test Post-test 1 Post-test 2	4-8 4-8 3-8	5.75±1.164 5.60±1.095 5.45±1.191	0.340	0.713
Day 2 E	Morning Pre-test Post-test 1 Post-test 2	4-7 4-6 3-5	5.50±0.827 4.95±0.826 4.30±0.733	11.379	0.001***
	Evening Pre-test Post-test 1 Post test 2	4-7 3-6 2-6	4.90±0.852 4.25±1.020 3.70±0.923	8.268	0.001***
C	Morning Pre-test Post-test 1 Post-test 2	3-7 3-7 3-8	5.00 ±1.170 5.05±1.146 4.95±1.191	0.037	0.964
	Evening Pre-test Post-test 1 Pos test 2	4-7 4-7 3-7	5.20±1.105 5.10±1.071 5.00±1.170	0.161	0.852

$F_{(2,57)}=2.92, p<0.05$, ***=very highly significant, **=Highly significant

Table 4b: Difference in the Pain scores in the experimental and control group on day 3 (Numerical pain scale) N=20+20

		Range	Mean±SD	F value	p value
Day 3 E	Morning Pre-test Post-test 1 Post-test 2	2-6 2-5 1-5	3.95±0.945 3.15±0.813 2.65±0.988	10.202	0.001***
	Evening Pre-test Post-test 1 Pos test 2	2-6 2-6 1-4	3.90±0.968 2.95±0.999 2.35±0.745	14.722	0.001***
C	Morning Pre-test Post-test 1 Post-test 2	2-6 2-5 1-5	5.05±1.146 4.95±1.317 4.85±1.268	0.129	0.879
	Evening Pre-test Post-test 1 Pos test 2	2-6 2-6 1-5	4.95±0.999 4.90±1.165 4.90±1.294	0.012	0.988

$F_{(2,57)}=2.92, p<0.05$, ***=very highly significant, **=Highly significant

II. Comparison of post-test scores of pain between the experimental and control group: To find the significant difference between the post-test scores of pain between the experimental and control group, the following null hypotheses is formulated. H0₂: There will be a significant difference in the post-test scores of pain level in postoperative open heart surgery patients between experimental and control group. To test the hypotheses, One Way ANOVA was used.

Table 5: Unpaired t test showing the significance of difference in the post-test score of pain using numerical pain scale, N=20+20

Duration	Observation	Group	t value	p value
Day 1 Morning	Post-test 1	E C	0.303	0.764
	Post-test 2	E C	0.820	0.416
Day 1 Evening	Post-test 1	E C	2.810	0.008**
	Post-test 2	E C	4.030	0.001***
Day 2 Morning	Post-test 1	E C	0.317	0.753

	Post-test 2	E	3.841	0.001***
		C		
Day 2 Evening	Post-test 1	E	2.571	0.014**
		C		
	Post-test 2	E	5.140	0.001***
		C		
Day 3 Morning	Post-test 1	E	5.202	0.001***
		C		
	Post-test 2	E	2.180	0.05*
		C		
Day 3 Evening	Post-test 1	E	5.682	0.001***
		C		
	Post-test 2	E	6.250	0.001***
		C		

$t_{38} = 2.03$, $p < 0.05$, **=Highly significant, ***=Very highly significant. E=Experimental group, C=Control group.

B. Effectiveness of foot and hand massage on anxiety

H0$_3$: There will be a significant difference between mean pre-test and post-test scores of anxiety in postoperative open heart surgery patients receiving hand and foot massage in the experimental group and control group.

Table 6a: Difference in the Anxiety scores of the experimental and control on Day 1 (FAS) N=20+20

		Range	Mean ±SD	F Value	p value
Day 1 E	Morning				
	Pre-test	2-3	2.75±0.444	7.966	0.001***
	Post-test 1	2-3	2.45±0.510		
	Post-test 2	1-3	2.05±0.686		
	Evening				
	Pre-test	2-3	2.70±0.470	13.170	0.001***
	Post-test 1	2-3	2.30±0.470		
	Post-test 2	1-3	1.80±0.695		
C	Morning				
	Pre-test	2-4	2.75±0.550	1.252	0.675
	Post-test 1	2-4	2.65±0.587		
	Post-test 2	1-4	2.45±0.686		
	Evening				
	Pre-test	2-3	2.60±0.502	2.000	0.145
	Post-test 1	1-3	2.40±0.598		
	Post-test 2	1-3	2.20±0.767		

$F_{(2,57)} = 2.92$, $p < 0.05$, ***=very highly significant, **=Highly significant, E=Experimental group, C=Control group

Table 6b: Difference in the Anxiety scores of the experimental and control on Day 2 and Day 3 (FAS) N=20+20

		Range	Mean ±SD	F Value	p value
Day 2 E	Morning				
	Pre-test	1-3	2.25±0.550	7.671	0.001***
	Post-test 1	1-3	2.00±0.561		
	Post-test 2	1-3	1.45±0.604		
	Evening				
	Pre-test	1-3	2.20±0.523	7.756	0.001***
	Post-test 1	1-3	1.85±0.670		
	Post-test 2	1-3	1.45±0.604		
C	Morning				
	Pre-test	1-3	2.55 ±0.510	4.475	0.016*
	Post-test 1	1-3	2.30±0.470		
	Post-test 2	1-3	2.10±0.447		
	Evening				
	Pre-test	2-3	2.35±0.587	2.526	0.089
	Post-test 1	1-2	2.15±0.587		
	Post-test 2	2-3	1.95±0.510		
Day 3 E	Morning				
	Pre-test	1-3	2.15±0.587	15.921	0.001***
	Post-test 1	1-2	1.70±0.470		
	Post-test 2	1-2	1.25±0.444		
	Evening				
	Pre-test	1-3	1.95±0.510	21.364	0.001***
	Post-test 1	1-2	1.55±0.510		
	Post-test	1-2	1.05±0.223		

				F value	p value
C	Morning Pre-test Post-test 1 Post-test 2	1-3 1-3 1-2	2.40±0.598 2.10±0.552 1.95±0.604	3.061	0.055*
	Evening Pre-test Post-test 1 Post-test	1-3 1-2 1-2	2.05±0.604 1.90±0.718 1.65±0.48	2.185	0.122

$F_{(2,57)}$=2.92, $p<0.05$,***=very highly significant,**=Highly significant, E=Experimental group, C=Control group

II. Comparison of the post-test Anxiety level of the experimental and control group (FAS): To find the difference between the post-test anxiety level of the experimental and control group, the following hypothesis is stated.

$H0_4$: There will be a significant difference in the post -test scores of anxiety in postoperative open heart surgery patients between experimental and control group (FAS).

Table 7: Unpaired t test showing the significance of difference in the post-test scores of anxiety (FAS) N=20+20

Duration	Observation	Group	t value	p value
Day 1 Morning	Post-test 1	E C	1.150	0.257
	Post-test 2	E C	1.843	0.073
Day 1 Evening	Post-test 1	E C	0.588	0.560
	Post-test 2	E C	1.726	0.092
Day 2 Morning	Post-test 1	E C	1.831	0.075
	Post-test 2	E C	3.270	0.002**
Day 2 Evening	Post-test 1	E C	1.505	0.141
	Post-test 2	E C	2.825	0.007**
Day 3 Morning	Post-test 1	E C	2.466	0.018**
	Post-test 2	E C	4.172	0.001***
Day 3 Evening	Post-test 1	E C	1.776	0.852
	Post-test 2	E C	4.987	0.001***

t_{38}=2.036,$p<0.05$, *=Significant **=Highly significant, ***=very Highly significant. E=Experimental group, C=Control group.

Table 8a: Difference in the anxiety scores in the experimental group and control group on day 1 and day 2 (STAI: Y-6) N=20+20

		Range	Mean±SD	F value	p value
Day 1 E	Morning Pre-test Post-test 1 Post-test 2	13-17 13-18 13-17	15.00±1.256 15.20±1.399 14.80±1.051	1.680	0.195
	Evening Pre-test Post-test 1 Post-test 2	13-16 13-16 13-16	15.15±0.875 15.05±1.050 15.00±0.918	0.129	0.879
C	Morning Pre-test Post-test 1 Post-test 2	13-17 13-18 13-19	15.15±1.268 15.35±1.460 15.70±1.454	0.794	0.457
	Evening Pre-test Post-test 1 Post-test 2	13-16 13-16 13-16	15.30±1.418 15.75±1.251 15.90±1.119	1.211	0.305
Day 2 E	Morning Pre-test post-test 1 post-test 2	13-17 12-17 12-16	15.00±1.698 14.85±1.225 14.90±1.046	1.475	0.237

		Range	Mean±SD	F value	p value
C	Evening Pre-test Post-test 1 Pos test 2	13-17 12-16 13-17	14.90±1.119 14.65±1.348 14.30±1.260	1.427	0.249
	Morning Pre-test Post-test 1 Pos test 2	13-17 12-17 12-16	15.40±1.391 15.60±1.273 15.55±1.394	0.118	0.889
	Evening Pre-test Post-test 1 Pos test 2	13-17 12-16 13-17	15.50±1.396 15.60±1.273 15.55±1.394	0.118	0.889

$F_{(2,57)}=2.92$, $p>0.05$, Not significant E=Experimental group, C=Control group.

Table 8b: Difference in the anxiety scores in the experimental group and control group on day 3 (STAI: Y-6) N=20+20

		Range	Mean±SD	F value	p value
Day 3 E	Morning Pre-test Post-test 1 Post-test 2	13-17 13-18 13-17	15.30±1.399 15.20±1.698 15.15± 1.356	0.126	0.882
	Evening Pre-test Post-test 1 Post-test 2	14-18 13-18 13-18	15.55±1.394 15.30±1.341 15.10±1.209	0.586	0.560
C	Morning Pre-test Post-test 1 Post-test 2	13-17 13-18 13-17	15.30±1.417 15.45±1.316 15.30±1.341	0.081	0.922
	Evening Pre-test Post-test 1 Post-test 2	14-18 13-18 13-18	15.55±1.468 15.30±1.417 15.40±1.429	0.794	0.903

$F_{(2,57)}=2.92$, $p>0.05$, Not significant :E=Experimental group, C=Control group.

Table 9: Unpaired t test showing significance between post-test scores of the experimental and control group (STAI-6) N=20+20

Duration	Observation	Group	t value	p value
Day 1 Morning	Post-test 1	E C	0.332	0.742
	Post-test 2	E C	2.990	0.005**
Day 1 Evening	Post-test 1	E C	1.757	0.087
	Post-test 2	E C	2.781	0.008**
Day 2 Morning	Post-test 1	E C	1.898	0.065
	Post-test 2	E C	2.950	0.005**
Day 2 Evening	Post-test 1	E C	0.005	2.974
	Post-test 2	E C	0.005	0.730
Day 3 Morning	Post-test 1	E C	0.582	0.564
	Post-test 2	E C	0.586	0.561
Day 3 Evening	Post-test 1	E C	0.000	1.000
	Post-test 2	E C	0.336	0.739

$t_{38}=2.03$, $p<0.05$, **=Highly significant, ***=very Highly significant.

3. Effectiveness of foot and hand massage on physiological parameters

I. To determine the difference between the pre-test and post-test scores of physiological parameters (SBP and DBP), the level HO_5 is formulated.

$H0_5$: There will be a significant difference between mean pre-test and post-test scores of physiological parameter(SBP,DBP) in postoperative open heart surgery patients receiving hand and foot massage in the experimental group and control group.

The mean post-test systolic and diastolic blood pressure scores of the experimental group on day 1, day 2 and day 3 (morning, evening) were significantly lower than mean pre-test systolic blood pressure scores of day 1, day 2 and day 3

(morning, evening) whereas. the mean post-test systolic blood pressure scores of the control group on day 1, day2 and day3 (morning, evening)were similar compared to the mean pre-test systolic blood pressure scores on day 1, day2 and day 3(morning, evening).The difference in the systolic and diastolic blood pressure scores of postoperative open heart surgery patients in the morning and evening was not found significant in the experimental group $F_{(2,57)}=2.92$, $p<0.05$. Thus null hypothesis $H0_5$ was accepted and research hypothesis was rejected.

II. Comparison between the post-test scores of SBP and DBP between the experimental and control group
$H0_6$: There will be a significant difference in the post -test scores of physiological parameters (SBP, DBP) in postoperative open heart surgery patients between experimental and control group.

There was no significant difference seen in the post-test systolic and diastolic blood pressure scores between the experimental and control group ($t_{38}=2.03$, $p>0.05$). Hence null hypotheses $H0_6$ was accepted and research hypotheses was rejected.

3. Effectiveness of foot and hand massage on physiological parameters (Respiration)
I. To determine the difference between the pre-test and post-test scores of physiological parameters (respiration), $H0_5$ is formulated.

$H0_5$: There will be a significant difference between mean pre-test and post-test scores of physiological parameters (respiration) in postoperative open heart surgery patients receiving hand and foot massage in the experimental group and control group.
To test the hypothesis, ANOVA was used.
The mean post test respiratory scores of the experimental group on day 1, day2 and day 3 (morning, evening) were significantly lower than mean pre-test respiratory scores of day1, day2 and day 3 (morning, evening) whereas the mean post-test respiratory scores of the control group on day 1, day2 and day3 (morning, evening) were similar compared to the mean pre-test respiratory scores on day 1, day2 and day 3(morning, evening). The difference in respiratory scores of postoperative open heart surgery patients in the morning and evening was not found significant in the experimental group $F_{(2,57)}=2.92$, $p<0.05$. Thus null hypothesis $H0_5$ was accepted and research hypothesis was rejected.

II. Comparison between the post-test scores of physiological parameters (respiration) between the experimental and control group
$H0_6$: There will be a significant difference in the post -test scores of physiological parameters (respiration) in postoperative open heart surgery patients between experimental and control group

Table 10: Unpaired t test showing significance between post-test scores of the respiration of the experimental and control group N=20+20

Duration	Observation	Group	t value	p value
Day 1 Morning	Post-test 1	E C	0.197	0.845
	Post-test 2	E C	0.089	0.929
Day 1 Evening	Post-test 1	E C	1.528	0.135
	Post-test 2	E C	1.618	0.114
Day 2 Morning	Post-test 1	E C	2.140	0.039
	Post-test 2	E C	3.120	0.003*
Day 2 Evening	Post-test 1	E C	2.053	0.047
	Post-test 2	E C	3.237	0.003*
Day 3 Morning	Post-test 1	E C	2.217	0.033
	Post-test 2	E C	3.159	0.003*
Day 3 Evening	Post-test 1	E C	1.696	0.098
	Post-test 2	E C	2.598	0.013*

$t_{38}=2.03, p<0.05$, **=Highly significant, ***=very Highly significant,

Data in Table 10 shows that there was a significant difference in the post-test 2scores of respiration on day 2 morning (t=3.120, p<0.01) and evening (t=3.127, p<0.01) and also there was significance in the post-test 2 scores of respiration on day 3 morning (t=3.159, p<0.01) and evening (t=2.598, p<0.05) between the experimental and control group. Hence null hypotheses $H0_6$ was accepted and research hypotheses was rejected.

2. Effectiveness of foot and hand massage on physiological parameters (heart rate)
To determine the difference between the pre-test and post-test scores of physiological parameters (heart rate), HO_5 is formulated.
$H0_5$: There will be a significant difference between mean pre-test and post-test scores of physiological parameters (respiration) in postoperative open heart surgery patients

receiving hand and foot massage in the experimental group and control group.

The mean post-test heart rate scores of the experimental group on day 1, day2 and day 3(morning, evening) were significantly lower than mean pre-test heart rate scores on day 1,day2 day3 (morning, evening). The mean post-test heat rate scores of the control group on day 1, day 2 and day 3 (morning, evening)were similar compared to the mean pre-test heart rate scores on Day 1,Day 2 and Day 3(morning:, evening:). The difference in the heart rate scores of postoperative open heart surgery patients in the morning and evening was not found significant in the experimental group $F_{(2,57)}=2.92$, $p<0.05$. Thus null hypothesis $H0_5$was rejected and research hypothesis was accepted.

II. Comparison between the post-test scores of physiological parameters (heart rate) between the experimental and control group
$H0_6$: There will be a significant difference in the post -test scores of physiological parameters (heart rate) in postoperative open heart surgery patients between experimental and control group

Table 11: Unpaired t test showing significance between post-test scores of the heart rate of the experimental and control group, N=20+20

Duration	Observation	Group	t value	p value
Day 1 Morning	Post-test 1	E C	2.818	0.045*
	Post-test 2	E C	2.652	0.012*
Day 1 Evening	Post-test 1	E C	1.274	0.210
	Post-test 2	E C	0.821	0.417
Day 2 Morning	Post-test 1	E C	1.705	0.096
	Post-test 2	E C	1.391	0.172
Day 2 Evening	Post-test 1	E C	1.241	0.222
	Post-test 2	E C	0.969	0.339
Day 3 Morning	Post-test 1	E C	0.396	0.694
	Post-test 2	E C	0.597	0.554
Day 3 Evening	Post-test 1	E C	0.221	0.827
	Post-test 2	E C	0.155	0.878

$t_{38}=2.03,p<0.05,*=$Significant

Data in table 11 shows that there was a significant difference seen in the post-test heart rate in the day 1 morning (t=2.818, p<0.05) and evening (t=2.652, p<0.05) between the experimental and control group on day 1.Hence null hypotheses $H0_6$ was partially rejected and research hypotheses was partially accepted.

Section IV: Association of Pain Level, Anxiety and Physiological Parameters with Selected Demographic Variables.
$H0_7$: There will be a significant association in pre-test scores of pain, anxiety and physiological parameters with selected demographic variables. Chi square test and Fisher exact test is used.

Table 12: Association of the Pre-test Scores and selected Demographic and Clinical Factors in the experimental and control group. N=20+20

	Demographic variable	NPS	FAS	Physiological parameters			
				SBP	DBP	Heart rate	Resp
		χ^2/t Value	χ^2/t Value	χ^2 Value	χ^2 Value	χ^2 Value	χ^2/t Value
E	Age	1.769	1.181	0.023	4.427	9.143	2.480
	Sex	0.325	1.111	0.159	1.399	0.729	1.991
	Marital status	0.067	4.137	5.440	8.341	8.974	2.224
	Educational status	6.508	3.822	4.524	11.433	19.833	9.159
	Nature of work	0.067	0.137	5.440	3.929	6.042	2.258
	Type of surgery	1.000	2.158*	0.573	0.381	2.667	3.348
C	Age of the patient	6.692	3.897	2.857	12.800	7.200	1.250
	Sex	0.369	0.260	0.807	5.625	1.786	0.255
	Marital status	2.248	11.692	0.952	9.333	10.857	0.139
	Educational status	12.70	8.966	2.934	23.611	13.952	2.639
	Nature of work	3.590	2.248	0.952	3.622	2.019	0.139
	Type of surgery	4.215	0.369	0.143	0.417	6.071	0.469

*/t=fisher exact test
$\chi^2{}_1=3.84, \chi^2{}_2=5.99, \chi^2{}_3=7.815, \chi^2{}_4=9.488, \chi^2{}_6=12.592, \chi^2{}_9=6.912$

The data depicted in table 12 shows that there is no significant association between pre-test scores of the experimental and control group with the selected demographic and clinical proforma.

Discussion
Major findings of the study and discussion of the findings with other studies
Demographic characteristics of the sample
It was observed that in the present study,

Equal number of sample (50%) in the experimental group as well as (50%) in the control group were in the age group of 51-60 years. Majority of subjects in the experimental Group (65%), and control group (80%) were males. These findings are supported by a randomised controlled trial to document the effectiveness of hand and foot massage on postoperative pain in Kasturba medical college manipal showed that out of 30 patients, highest number were in the experimental group (33.3%) and control group (40%) were in the age group of 41-60 years and most of them were males [96]. Most of the subjects in the experimental group (25%) and control group (40%) had secondary education. Majority of subjects in the experimental group (65%) and the control group (75%) were married. Similar study conducted at Ahvaz Jondishapur Medical University with the aim to determine the effect of foot and hand massage on cardiac surgery pain which showed that majority in the experimental group (96.9%) and control group (91%) were married. Another study conducted to document the effectiveness of Hand and Foot massage on postoperative pain in the CT ICU which at Kasturba Medical College Hospital, Manipal. Showed that out of 30 patients maximum number of subjects in the experimental group and control group (46.7%) had secondary education [96]. In the present study, majority of the subjects in the experimental Group (80%), and the control group (85%) had no history of previous surgery. Another study conducted at Ahvaz Jondishapur Medical University with the aim to determine the effect of foot and hand massage on cardiac surgery pain also showed that (53.1%) in the experimental group and (51.5%) had no history of previous surgery. Most of the subjects in the present study had undergone open heart surgery (75%) as well as control group (80%) had undergone open heart surgery such as CABG. Another study conducted to document the effect of massage therapy for cardiac surgery patients in cardiothoracic surgical unit Alfred hospital, Victoria, Australia showed that majority in the experimental group (49%) and control group (53%) had undergone CABG surgery [102].

Description of pain level in postoperative open heart surgery patients
The present study shows that there was moderate pain in majority of samples on posttest 1 and posttest 2 in the experimental group on postoperative day 1 morning and evening which reduced to mild pain in majority of patients (95%) on posttest 2 on postoperative day 3 evening, which shows that there was significant difference on the level of pain based on numeric pain scale.

The similar studies conducted in Kasturba medical hospital, Manipal showed that majority of the samples (93.3%) in the experimental and control group had severe pain on postoperative day 1 and pain intensity decreased gradually to mild pain in experimental group from day 1 to day 3(p<0.01) which shows that there was a statistical significant difference on the level of pain based on numeric pain scale(p=0.02)in the experimental group compared to the control group [96].

Description of anxiety in open heart surgery patients
The present study shows that on day 1 morning, in pre-test score, highest percentage (75%)subjects had anxiety score 3. Majority of the subjects (55%)had anxiety score 2 on posttest1 and posttest 2. Whereas in control group on pre-test most of the subjects(65%)had anxiety score 3.Most of the subjects (55%)had anxiety score 3 on post-test 1 and anxiety score 2 and anxiety score 3 on post-test 2. Findings of the present study were supported by a systematic review on anxiety, depression and self management in CABG/valve replacement surgery patients in Ontario, Canada showed that in the CABG/valve replacement surgery patients approximately 29-61% patients experienced moderate level of anxiety upto 6 months following surgery, while 62.5% experience moderate level of anxiety at the time of hospital discharge [126].

In a study to evaluate the presence of anxiety and depression in patients before and after CABG and their association with age in Germany, hundred and forty two consecutive patients who underwent CABG were recruited for the study. Anxiety and depression was assessed by the Hospital Anxiety Depression scale two days before and ten days after CABG. Results revealed that 34% were clinically anxious before CABG and 24.7% after CABG [127].

Section C: Effectiveness of foot and Hand massage on pain, anxiety and physiological parameters in postoperative open heart surgery patients
The present study shows that the mean posttest pain scores of day 1,day2 and day3 (morning, evening) were significantly lower than the mean pretest scores on postoperative day 1, day 2 and day 3(morning, evening). The difference in the pain scores of postoperative patients in the morning and evening on day1,day2 and day3 was found significant in the experimental group ($F_{2,57}$=2.92, p<0.05).

A Similar study was conducted to determine whether massage therapy significantly reduces pain in cardiac surgery patients in Australia showed that there was significant difference in the level of pain on day 1 (p=0.001) and pain was significantly reduced on day 3 and day4(p<0.0001) in the experimental group.

Comparison of post-test scores of pain between the experimental and control group: The present study showed that there was a significant difference in the post-test scores of pain (post-test 1-t=2.81, post-test 2-t=4.03, p<0.001) in the day 1evening.,(post-test 2, t=3.84, p<0.001) in the day 2 morning and (post-test 2, t=5.14, p<0.001) in the day 2 evening and significance difference also was found in the post-test pain scores (post-test 1, t=5.202, p<0.001, post-test 2, t=2.18, p<0.05) in the day 3 evening (t=5.682, t=6.25, p<0.001) between the experimental and control group.

Study findings of a study conducted to assess the effect of foot and hand massage on cardiac surgery pain among 65 patients in Iran also showed that there was significant difference in pain intensity immediately and 24 hours of the intervention. The pain severity of the intervention group (p<0.001) was significantly lower than the control group (p>0.001) [129].

Evaluation of effectiveness of foot and hand massage on postoperative Anxiety (FAS)
Significance of difference in pre-test and post-test scores of anxiety in experimental and control group
Results of the present study showed The difference in anxiety scores of postoperative open heart surgery patients in the morning and evening was found significant in the experimental group $F_{(2,57)}=2.92$, $p<0.05$. A similar study was conducted in two hospitals affiliated to Baqiyatallah University of Medical Sciences in Tehran. Results of study indicated that there was statistically significant difference between the mean of anxiety and agitation level in groups at different stages of time ($P<0.001$) [130].

Comparison of the post-test Anxiety level of the experimental and control group (FAS)
There was significance difference in the post-test 2 anxiety scores on day 2 (Morning=3.270, $p<0.001$, Evening=2.825, $p<0.001$). There was also significance in the post-test anxiety scores on day 3 morning (post-test 1, t=2.466, $p<0.05$; post-test 2, t=4.172, $p<0.001$) and evening (post-test 2, t=4.987, $p<0.001$) between the experimental and control group.
A similar study conducted on examining the Effects of Reflexology on Anxiety of Patients Undergoing Coronary Angiography in Shahid Behesthi Hospital, Iran. Study results of Mann-Witney U test showed that the anxiety reduction was significantly higher in foot reflexology group (Z=-2.468, P=0.014) [53].

Significance of difference of anxiety in pre-test and post-test scores of anxiety (STAI-6)
The mean post test anxiety scores of the experimental group on day 1, day2 and day 3 (morning, evening) were significantly lower than mean pre-test anxiety scores of day1, day2 and day 3 (morning, evening) whereas. the mean post test anxiety scores of the control group on day 1, day2 and day3 (morning, evening)were similar compared to the mean pre-test anxiety scores on day 1,day2 and day 3(morning, evening).One Way ANOVA showed the difference in anxiety scores of postoperative open heart surgery patients in the morning and evening was not found significant in the experimental group $F_{(2,57)}=2.92$,$p>0.05$.
A study was conducted on effectiveness of foot reflexology on anxiety following open heart surgery showed that in the experimental group on Day 1, the post-test scores of mean anxiety level (1.18±2.19) was lower than pre-test scores (1.93±2.81). On Day 2, in the experimental group the mean post-test anxiety scores were 1.33±2.60 lower than the mean pre-test anxiety scores 2.13±2.80.Whereas in control group, the mean posttest scoreson day 1(1.90±2.12),day 2(2.13±2.59) were significantly higher than pretest scores on day 1 (1.78±2.11)and day 2 (2.13±2.84)

Comparison of the post-test Anxiety level of the experimental and control group (STAI-6)
There was a significant difference in the mean post-test anxiety scores on day 1 (morning: post-test 2, t=2.990, $p<0.001$, evening: post-test 2, t=2.781, $p<0.05$) and there was also significance on day 2 morning (post-test 2, t=2.950, $p<0.05$) between the experimental and control group. Hence the null hypotheses, HO_3 was rejected and research hypotheses was accepted.

A study on effect of hand reflexology on anxiety and physiological variables among patients hospitalized in the cardiac care unit in Tehran, Iran was conducted. The anxiety level was assessed immediately after the intervention and 30 min after the intervention. Results showed that the anxiety level was reduced in the intervention group (p=.003, η=0.09) compared to the control group [131].

Effectiveness of foot and hand massage on physiological parameters
Significance of difference in pre-test and post-test scores of physiological parameters (blood pressure, heart rate and respiration) in experimental and control group
The present study showed that there was no. significant difference between the pre- and post-test scores of blood pressure(systolic and diastolic),heart rate and respiration of postoperative open heart surgery patients ($F_{2,57}=2.92$, $p>0.05$). A study conducted on massage therapy for cardiac surgery patients on pain, anxiety and muscular tension in a cardiothoracic surgical unit, Alfred hospital, Australia, showed that there was effect of massage therapy on systolic and diastolic blood pressure, but there was no significant difference seen in the variables [102].
A study was conducted on effect of foot reflexology on physiological parameters and mechanical ventillation weaning time in paients undergoing open heart surgery which shows that physiological parametrs (pulse rate, systolic and diastolic blood pressure, respiratory rate) did not differ significantly at any point of time (p>0.05)
A study was conducted on effect of foot reflexology on physiological parameters before coronary angiography in Kashan Hospital, Iran showed that the mean respiratory rate before the intervention (p=0.49) and control groups (p=0.13) was not significant between the two groups that consistent.

Comparison of the post-test scores of physiological parameters of the experimental and control group
Present study shows that there was no significant difference in the post-test systolic and diastolic blood pressure scores between the experimental and control group (p>0.05).
A study was conducted on effect of massage therapy on vital signs and GCS scores of intensive care unit in Baqiyatullah University, Iran. Paired t test was used for the comparison of experimental and control group which showed there was no significant difference in the systolic blood pressure (P=0.105), diastolic blood pressure (p=0.239), pulse rate (p=0.878), respiratory rate (p=0.442).
There was significant difference in the post-test 2 respiratory scores on Day 2 morning: t=3.120, $p<0.001$, evening: t=3.127, $p<0.001$) and also there was significant difference in the post-test 2 scores of respiration on Day 3 morning (t=3.159, $p<0.05$) and evening (t=2.598,$p<0.05$) between the experimental and control group. A similar study was conducted on the effects of foot and hand massage on pain of open heart surgery patients in Intensive care units in Lattakia. The study results showed that the respiration rate of the intervention group was 22.99±4.01 before the intervention that reached 19.98±4.12 after massage (p=0.001) [99].
In the present study there was significant difference in the post-test heart rate in the Day 1 morning (t=2.818, $p<0.05$) and evening (t=2.652, $p<0.05$) between the experimental and control group. A similar study was conducted on effects of foot and hand massage on pain of open heart surgery

patients in Intensive care units. Findings of the paired t test showed that there was a significant difference in the post-test scores of heart rate (p<0.001) compared to the control group (p=0.124) [99].

Association of pre-test scores of pain, anxiety and physiological parameters with selected demographic variables

There was no significant association between the pre-test scores of the experimental and control group with the selected demographic and clinical proforma like age, sex, marital status, educational status, history of previous surgery and type of open heart surgery.

The study findings is supported by a experimental study conducted on the effect of massage therapy on pain, anxiety and tension in cardiac surgical patients revealed that there was no significant association between the, education status, occupation and marital status of the patient (p>0.05) [134].

Limitations

- The study was conducted only in a few hospitals at Mangaluru which imposed restrictions on generalisation of findings.
- The study was conducted only on the first three days after the open heart surgery in cardiothoracic ICU.
- Another limitation was that the samples had difficulty in answering the Speilberger's state Trait anxiety inventory (STAI) which has 20 items, so the researcher had to use the short form of STAI which has 6 items to assess the anxiety.
- Many dropouts were experienced during the study as some of the patients were shifted from ICU to ward on postoperative second day.
- Another limitation was difficulty in getting the samples within the limited period of time, because open heart surgeries were not conducted regularly.

Conclusion

The following conclusions were drawn on the basis of the findings of the present study:

1. Majority of the patients after undergoing open heart surgery experienced moderate to severe pain during the first few days after surgery
2. Postoperative patients also experienced moderate to severe level of anxiety
3. The mean post-test pain scores of the postoperative patients on three consecutive days in the morning and evening were lower than the mean pre-test pain scores.
4. There was a significant difference in the anxiety level of the postoperative patients after open heart surgery on day 1, day 2 and day 3.
5. There was a significant difference in the post-test scores of physiological parameters (heart rate and respiration) of postoperative open heart surgery patients on day 1, day 2 and day 3.
6. There was no significant association between the demographic variables like age, sex, marital status, educational status, nature of the work, type of surgery between the pre-test scores of pain, anxiety and physiological parameters.

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